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VERY SHORT RANGE STATISTICAL FORECASTING OF AUTOMATED

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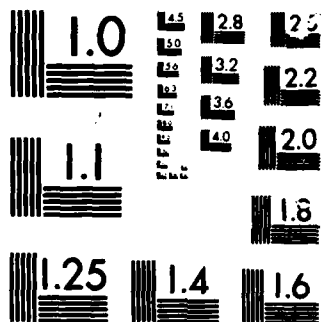
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Program Engineering
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Washington, D.C. 20591

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**Very Short Range Statistical
Forecasting of Automated Weather
Observations**

AD-A167 049

Robert G. Miller, Ph. D.

March 1986

Interim Report

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16. Abstract A procedure is developed for providing weather forecasting guidance over the short period of 10, 20, 30, 60 minutes. It uses automated surface observation elements as predictors and predictands. The model is founded on Markov assumption and utilizes multivariate linear regression as the statistical operator. Details are given on how the Generalized Equivalent Markov (GEM) model is constructed and how it compares with other objective methods such as climatology and persistence. Tests are performed on an independent data sample. Overall, GEM succeeds in bettering persistence and does so uniformly over the 6 projection periods of 10, 20, 30, 60 minutes.			
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1. INTRODUCTION

A recent analysis of rotorcraft operations (Taylor and Adams, 1985) indicates that the "typical flight mission consists of Point A to Point B flights that average 22 minutes in length, incorporating 5 interim stops for a total round-robin flight averaging 1 hour 48 minutes." The granularity (geographic and time) of weather information for rotorcraft operations is very small in comparison with what is required for fixed wing operations. Thus, the rotorcraft pilot has little interest in mid-range (4-6 hours) weather forecasts. What is needed is short range (10-120 minutes) forecasts for short range distances. The unique characteristics of rotorcraft allow them to land at places where airplanes can not. Many of these landing areas have low density traffic which does not justify a weather observer much less a forecaster. The rotorcraft community is extremely interested in an automatic weather sensor and an associated system for short term weather forecasting. It is for this reason that the FAA is sponsoring the NWS effort described in this report.

A statistical technique for predicting the probability distribution of all surface weather elements inside one hour is called GEM for a Generalized Equivalent Markov model. It uses only the current local automated surface weather conditions as predictors. From these probability distributions, categorical predictions are made for each automated surface weather element. The technique is a Markov procedure which is briefly described in the following quotation from William Feller (1950):

"In stochastic processes the future is never uniquely determined, but we have at least probability relations enabling us to make predictions The term "Markov process" is applied to a very large and important class of stochastic processes Conceptually, a Markov process is the probabilistic analogue of the processes of classical mechanics, where the future development is completely determined by the present state and is independent of the way in which the present state has developed ... in contrast to processes ... where the whole past history of the system influences its future."

GEM is a multivariate linear regression system in which all variables, both predictors and predictands, are zero-one. It is Markovian in that it uses only the most recent observation of the automated surface weather elements to predict the probability distribution of those same automated weather elements. In the original hourly GEM approach, an iterative scheme was employed. For such short time projections as one minute, the iteration scheme has been replaced by equations which predict directly to the desired projection time of interest.

The mathematical model is given in Section 2. Section 3 presents results comparing GEM with persistence. Section 4 gives a summary and discusses future plans.

2. TECHNIQUE DEVELOPMENT

This section describes the procedure from the mathematical model, through data preparation and statistical analyses, to a discussion of a nonlinear prediction method. The reader is referred to a NOAA Technical Report for further details (Miller, 1981).

2.1. Mathematical Model

Assumed given are measurements on a set of Z_1, Z_2, \dots, Z_p predictor variables and a set of $Y_{1,t}, Y_{2,t}, \dots, Y_{q,t}$ predictand variables at projection time t for a group of N observations. The problem of multivariate regression is to construct a set of Q linear functions

$$\begin{aligned}\hat{Y}_{1,t} &= a_{1,0,t} + a_{1,1,t}Z_1 + a_{1,2,t}Z_2 + \dots + a_{1,p,t}Z_p + \dots + a_{1,p,t}Z_p \\ \hat{Y}_{2,t} &= a_{2,0,t} + a_{2,1,t}Z_1 + a_{2,2,t}Z_2 + \dots + a_{2,p,t}Z_p + \dots + a_{2,p,t}Z_p \\ &\vdots \\ \hat{Y}_{q,t} &= a_{q,0,t} + a_{q,1,t}Z_1 + a_{q,2,t}Z_2 + \dots + a_{q,p,t}Z_p + \dots + a_{q,p,t}Z_p \\ &\vdots \\ \hat{Y}_{Q,t} &= a_{Q,0,t} + a_{Q,1,t}Z_1 + a_{Q,2,t}Z_2 + \dots + a_{Q,p,t}Z_p + \dots + a_{Q,p,t}Z_p\end{aligned}\quad (1)$$

which have the property that the sum of the squares of the errors

$$\begin{aligned}\epsilon_{q,t}^2 &= \sum_{i=1}^N (Y_{i,q,t} - \hat{Y}_{i,q,t})^2 = \sum_{i=1}^N (Y_{i,q,t} - a_{q,0,t} - a_{q,1,t}Z_{i,1} - \\ &\dots - a_{q,p,t}Z_{i,p} - \dots a_{q,p,t}Z_p)^2 \quad (q=1, 2, \dots, Q)\end{aligned}\quad (2)$$

are as small as possible. That is, the problem is to determine values of the $a_{q,p,t}$'s ($q = 1, 2, \dots, Q$; $p = 1, 2, \dots, P$) which minimize the quantities

$$\epsilon_q^2 \quad (q=1, 2, \dots, Q; t=10, 20, \dots, 60)$$

This is done by taking the partial derivatives of Eq. (2) with respect to the unknown a 's, setting each derivative equal to zero, and then solving for the a 's. The process yields a set of normal equations which can be written in matrix notation as (underlining signifies a matrix or vector):

$$\underline{A}_t = (\underline{Z}'\underline{Z})^{-1}(\underline{Z}'\underline{Y}_t) \quad (t = 10, 20, \dots, 60) \quad (3)$$

Expressed statistically this is the multivariate linear regression of the Y 's on the Z 's (Tatsuoka, 1971, pp. 26-38). In GEM, the Y values are advanced by 10, 20, 30, 40, 50, and 60 minutes from the corresponding Z values. Thus

$$Y_{i+t,q} = Z_{i,q}$$

and

$$Y_{i+t,p} = Z_{i,p} \quad (i=1,2, \dots, N; q=1,2, \dots, Q; p=1,2, \dots, P; \\ t = 10, 20, \dots, 60).$$

Once the A_t 's have been determined, they can then be used to estimate the value of y at each 10-minute time step, given a set of z values at a zero time step (lower case values denote new forecast Y based on new observation Z):

$$\hat{y}_t = z_0 A_t \quad (t = 10, 20, \dots, 60) \quad (4)$$

2.2. Data Preparation

Data collection began at the National Weather Service's Techniques Development and Test Branch location at Sterling, Virginia, in April 1984. The following weather elements are observed once a minute by equipment similar to the FAA's Automated Weather Observing System (AWOS). The elements are:

- o Lowest cloud hit
- o Second cloud hit
- o Third cloud hit
- o Fourth cloud hit
- o Visibility
- o Station pressure
- o Temperature
- o Dew point temperature
- o Wind speed
- o Wind direction
- o Precipitation amount in one minute
- o Precipitation occurrence
- o Frozen precipitation occurrence (when successfully measured)
- o Date of the observation

The elements were transformed into categories, and dummy predictors and predictands were created. Table 1 in columns 3 and 4 shows the specific categories defined for each zero-one dummy predictor. Column 1 indicates the dummy variable number while column 4 gives the index of that variable. One dummy variable must be "left-out" because of mathematical redundancy.

2.3. Statistical Analyses

The statistical analyses which are performed on these data result from the processing of crossproduct matrices. The actual steps are as follows:

Step 1. Compute the $Z'Z$ and $Z'Y_t$ crossproduct matrices from the data matrices Z and Y_t .

Step 2. Solve for A_t from $A_t = (Z'Z)^{-1}(Z'Y_t)$ where A_t is the matrix of regression coefficients for making a t-minute forecast.

Step. 3. Solve for the threshold probabilities p^* for making categorical forecasts.

Derivation of the two crossproduct matrices $\underline{Z}'\underline{Z}$ and $\underline{Z}'\underline{Y}_t$, in step 1, was accomplished by using a pointer system which saved a considerable amount of computer time. This efficiency is made possible because of the zero-one nature of the observations.

For the labeled predictors in Table 2, Column 4 gives the sum row of the $\underline{Z}'\underline{Z}$ matrix and Column 5 the lowest cloud hit row of the $\underline{Z}'\underline{Y}_t$ matrix where $t = 10$ minutes. This column gives the products between the \underline{Y} variable for lowest ceiling hit times each of the 88 predictors over the sample N.

We solved for the regression coefficient matrix \underline{A}_t in step 2 using the Crout method (Crout, 1941). This method does not require solving for the inverse matrix, $(\underline{Z}'\underline{Z})^{-1}$, but instead derives the regression coefficients by first a forward and then a backward solution. Avoided are many of the computational instabilities encountered by inverting large matrices. The Crout method yields an 88×87 matrix--88 predictor coefficients for each of 87 predictands.

The lowest cloud hit equation for the \underline{A}_t matrix at $t = 10$ minutes appears as Column 6 in Table 2.

2.4. Nonlinear Prediction Approach

Meteorologists have desired forecast guidance that is capable of predicting changes in the weather, such as frontal passages and their attendant weather variations, onset and discontinuation of severe weather (types and intensities), wind shifts and wind speed variations, as well as ceiling and visibility changes of a critical nature for aviation. Classical statistical approaches like regression have not succeeded in completely satisfying this desire, partly due to the additive nature of the statistical model currently employed. What seems to be needed is a model which will act in a multiplicative fashion--one capable of completely shutting down the prediction of an event when the antecedent conditions warrant. For example, when it rains, it is "never" preceded 1 minute before by a clear sky. However, a statistical-regression operator will fail to turn off the chance of rain fully if there are other antecedent conditions, say, easterly wind, high humidity, fog, and low visibility--conditions which are usually associated with future occurrences of rain. Regression would tend to increase the probability of rain because of each of these elements. In general with regression, the lack of any clouds would not be enough to negate completely the effect of these other elements.

Fortunately, there is a statistical model or operator which possesses this necessary capability. The discrete likelihood function (DLF) approach is fairly new (see Miller, 1979), but the basis for its existence is founded on the work of the eminent statistician, Sir Ronald A. Fisher, whose own work and

ideas on this subject were derived from the inverse probability notions of Bayes in the mid-eighteenth century. Basically, the concept is this: given that we observe a set of current conditions of the weather, the question to be asked is "What is the likelihood that these current conditions are those that would be the conditions preceding rain and, conversely, what is the likelihood that these current conditions are those that would be the conditions preceding no rain?" The two likelihoods are obtained by multiplying the conditional probabilities of each antecedent condition thus getting the joint probability of the entire observation. It should be emphasized that the presence of any antecedent condition which is incongruous with an event of interest (say, rain) will have a dramatic effect on that likelihood: it will force the likelihood to zero. Such a nonlinear system would seem to conform with meteorologists' desires. Should the usual conditional probabilities (posteriors) be of interest, they can be gotten directly from Bayes' theorem and the climatological frequencies of the possible events (priors). The linearly independent likelihoods are obtained from a set of regression estimated probabilities (REEP) (see Miller, 1964). Empirical evidence has shown that rarely if ever is a REEP probability of an event < 0 when the event occurs and > 1.0 when it does not occur. Certainly the situations arise when REEP forecasts $P < 0$ and $P > 1$. However, truncating these REEP forecasts to 0 and 1.0, respectively, does not seem to invalidate the reliability of the estimates.

When nonlinearity of the type just discussed is present in the data, an alternative approach may be more practical. It goes as follows:

- o Test for the equality of the predictand-group covariance matrices Σ_g using Bartlett's multivariate test (see Morrison, 1967).
- o If the test suggests inequality among the Σ 's, then proceed to test logical (boolean) combinations of predictor pairs. When certain pairs show predictive information over and above the basic set of predictors, include them into the GEM model.
- o All of the usual GEM manipulations follow as before, such as solving for the coefficient matrix \underline{A} and determining the threshold probabilities for making categorical forecasts.

3. VERIFICATION RESULTS

To demonstrate the ability of the GEM equations to predict at a 10-minute projection, Brier scores (residual variances) have been computed on the developmental sample for climatology, persistence, and GEM for each of the predictands of interest. These are given in Table 3 for the specified dummy variables. The Brier score for persistence as defined here uses only that dummy element corresponding to the specific predictand dummy. A greater reduction (lower values are better) in Brier score for persistence could have been achieved if all dummies of the predictand element were used as

predictors. All dummies of a predictand element were not used as predictors in computing persistence's Brier score for two reasons: a) the procedure is so complex that it would severely strain the resources available to this project, and b) more importantly, persistence's function is as a simple, readily-available "no skill" statistical control. The more complex procedure is neither "readily available" nor simple, but a full-blown statistical forecasting procedure unto itself. The development of such a procedure is beyond the scope of this project.

3.1. Comparative Verification on Independent Data

In May 1985, independent data predictions were begun on 12 weather elements 10, 20, ..., 60 minutes in advance. A one full year of data (April 1984-April 1985) represented the developmental sample. A complete display of the roughly 100,000 forecasts made on data from May through August 1985 is given in the Appendix including:

- o Contingency tables,
 - GEM versus actual
 - Persistence versus actual
 - o Biases,
 - o Percentage correct,
 - o Heidke skill score,
 - o χ^2 goodness of fit on the margins, and
 - o Threat score (critical success index)
- for all six projections.

A summarization of these scores is given in Table 4. For each weather element and each projection, the score values are compared between GEM and persistence. The better score received a "G" if it belonged to GEM or a "P" if it belonged to persistence. A "T" signifies a tie. The frequencies of these designations are totaled to give the overall comparison.

4. SUMMARY AND PLANS

4.1 Summary

Overall GEM succeeds in bettering persistence (84 to 42) and does so uniformly over the six projection periods of 10, 20, ..., 60 minutes. GEM manages to accomplish this through consistent superiority in the threat score--an important measure of the skill of a procedure to predict rare events. GEM, however, seems to lack the balance (predicted frequency equaling observed frequency) for doing as well in the Heidke skill score. Such a characteristic seems correctable with a more appropriate threshold or loss function. A

successful improvement here could produce comparisons that would be even better than at present without any new predictive information being added. In particular, GEM's categorical wind direction forecasts do not realize the advantage they possess over persistence as demonstrated in the Brier score.

4.2 Plans

- Processing FAA data on a microcomputer has been successful. However, the raw data reside on 400 floppy disks. In the future all of these data will be stored on a single 20 megabyte hard disk.
- A new software architecture is planned to store the data as bits (since GEM's variables are all 0-1). Processing can be accomplished very efficiently using logical operations on integers.
- Computer experience with the Kaypro 10 micros has been exceptionally good. They have run 24 hours a day, seven days a week without a computer failure at Sterling, Virginia. Similar reliability has been achieved with the FAA's two research Kaypro 10's.
- It is advisable to institute a quality control of the input data at the time it is being collected; one that will provide an alert for erroneous or missing (instrument malfunction) information at the source.
- As things stand, the anticipated collection of Atlantic City and Indianapolis data will not be sensor-variable compatible with Sterling, Virginia. For example, cloud hits are taken 4 times each minute at Sterling, Virginia but are taken only 2 times each minute at Atlantic City, New Jersey.
- Further installations at Atlantic City and Indianapolis will permit us to test whether the GEM equations can be made general so as to apply at any location without the need to collect 2 years of weather observations first.
- We will embark on a full fledged AWOS system to predict 10, 20, ..., 60 minutes after the observation as against our previous efforts to predict sensor variables.
- Efforts will continue to verify forecasts based upon independent data.

- A rigorous investigation is planned to uncover and utilize nonlinear predictive information. Such an effort requires a computer upgrade, the new software architecture, and the Pascal language.
- In conjunction with this, the National Weather Service plans to upgrade from Kaypro 10's to Kaypro 286i's.
- A method will be developed for converting GEM's probability forecasts into categorical forecasts in a more optimal fashion than what beta thresholds have provided.

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APPENDIX

This appendix has two parts. The first part consists of tables which are referred to in the text as Tables 1-4. The second part contains the actual contingency tables and scores computed from the comparative verification between GEM and persistence. These verification statistics are arranged with GEM's results for 10, 20, 30, 40, 50, and 60-minute projections followed by persistence results for 10, 20, 30, 40, 50, and 60-minute projections.

The verification statistics are presented for the following elements:

- Lowest cloud hit
- Second cloud hit
- Third cloud hit
- Fourth cloud hit
- Visibility (miles)
- Station pressure (inches of Hg)
- Temperature (°F)
- Dew point depression (°F)
- Wind speed (kt)
- Wind direction (deg)
- Precipitation amount (inches)

for the following scores:

- Contingency table
- Biases (row total/column total)
- Percentage correct (hits/total number of forecasts)
- Heidke skill score (hits-chance hits)/(total-chance hits)
- Chi-square goodness of fit on margins [(predicted totals-observed totals)²/observed totals]
- Threat score or critical success index [hits/(number of forecast + number of observed-hits)]

During the period of the present verification, May 1985-August 1985, there were no yes/no precipitation measurements. The instrument was found to have been inoperative. As a result, all of the yes/no precipitation comparative verifications should be disregarded. Apparently, the tipping bucket precipitation amount measurements were not affected.

Table 1. Predictor and predictand categories which specify the dummy variables used in GEM. Shown under the index column are the left-out categories not included because of redundancy.

Number	Weather Element	Category	Index
1	(Always unity)		1
2	Lowest cloud hit (00')	0 - 1	2
3		2 - 4	3
4		5 - 9	4
5		10 - 29	5
6		30 - 60	6
7	Second cloud hit (00')	61 - UNL	Left out
8		0 - 1	7
9		2 - 4	8
10		5 - 9	9
11		10 - 29	10
12	Third cloud hit (00')	30 - 60	11
13		61 - UNL	Left out
14		0 - 1	12
15		2 - 4	13
16		5 - 9	14
17	Fourth cloud hit (00')	10 - 29	15
18		30 - 60	16
19		61 - UNL	Left out
20		0 - 1	17
21		2 - 4	18
22	Visibility (miles)	5 - 9	19
23		10 - 29	20
24		30 - 60	21
25		61 - UNL	Left out
26		0 - 31/64	22
27	Station pressure (inches of Hg)	1/2 - 63/64	23
28		1 - 2 63/64	24
29		3 - 4 64/64	25
30		5 - 6 63/64	26
31		7 - 100	Left out
32	Temperature (°F)	0 - 29.235	27
33		29.236 - 29.530	28
34		29.531 - 29.677	29
35		29.678 - 29.825	30
36		29.826 - 29.973	31
37		29.974 - 30.120	32
38		30.121 - 30.268	33
39		30.269 - 30.563	34
40		30.564 - 35.000	Left out
41		- ∞ - 4	35
42		5 - 14	36
43		15 - 24	37
44		25 - 34	38

Table 1. Continued.

Number	Weather Element	Category	Index
45		35 - 39	39
46		40 - 44	40
47		45 - 49	41
48		50 - 54	42
49		55 - 59	43
50		60 - 64	44
51		65 - 74	45
52		75 - 84	46
53		85 - 94	47
54		95 - 110	Left out
55	Dew point depression (°F)	0 - 1	48
56		2 - 7	49
57		8 - 15	50
58		16 - 25	51
59		26 - 99	Left out
60	Wind speed (kt)	0 - 1	52
61		2 - 9	53
62		10 - 19	54
63		20 - 29	55
64		30 - 99	Left out
65	Wind direction (deg)	00 - 44	56
66		45 - 89	57
67		90 - 134	58
68		135 - 179	59
69		180 - 224	60
70		225 - 269	61
71		270 - 314	62
72		315 - 359	Left out
73	Precipitation amount (inches)	.002 - .100	63
74		.001 - .0019	64
75		.000 - .0009	Left out
76	Precipitation occurrence (Y or N)	Yes	65
77		No	Left out
78	Frozen precipitation (Y or N) (when successfully measured)	Yes	66
79		No	Left out
80	Month	January	67
81		February	68
82		March	69
83		April	70
84		May	71
85		June	72
86		July	73
87		August	74
88		September	75

Table 1. Continued.

Number	Weather Element	Category	Index
89		October	76
90		November	77
91		December	Left out
92	Hour (LST)	00 - 01	78
93		02 - 03	79
94		04 - 05	80
95		06 - 07	81
96		08 - 09	82
97		10 - 11	83
98		12 - 13	84
99		14 - 15	85
100		16 - 17	86
101		18 - 19	87
102		20 - 21	88
103		22 - 23	Left out

Table 2. Quantities derived for the designated dummy variables; the number of times each category occurred in the sample (ΣZ), the number of times each predictor occurred when it was followed by the lowest cloud hit ten minutes later (ΣZY), and the regression coefficient for each predictor when lowest cloud hit was the predictand (A).

Index	Element	Category	ΣZ	ΣZY	A10
1	(Always unity)		421803	8348	.04607
2	Lowest cloud hit (00')	0 - 1	8463	2300	.08631
3		2 - 4	21522	1097	-.01161
4		5 - 9	15660	223	-.00709
5		10 - 29	33872	244	-.00107
6		30 - 60	37845	209	-.00032
7	Second cloud hit (00')	0 - 1	2371	1512	.38899
8		2 - 4	12675	1266	.04696
9		5 - 9	10855	168	.01115
10		10 - 29	28144	191	.00779
11		30 - 60	32221	149	-.00246
12	Third cloud hit (00')	0 - 1	1312	911	.13030
13		2 - 4	11141	1435	.02128
14		5 - 9	10146	174	.00469
15		10 - 29	25915	182	-.00176
16		30 - 60	28200	108	-.00049
17	Fourth cloud hit (00')	0 - 1	635	446	.02371
18		2 - 4	9535	1457	-.00402
19		5 - 9	9629	180	-.03725
20		10 - 29	23260	177	-.00953
21		30 - 60	23923	81	-.00051
22	Visibility (Miles)	0 - 31/64	2254	346	.08842
23		1/2 - 63/64	2975	647	.10000
24		1 - 2 63/64	16285	2150	.05339
25		3 - 4 63/64	29549	882	.00551
26		5 - 6 63/64	28667	474	.00879
27	Station pressure (inches of Hg)	0 - 29.235	253	2	-.00512
28		29.236 - 29.530	5327	49	-.00526
29		29.531 - 29.677	10827	135	-.00421
30		29.678 - 29.825	47564	945	.00268
31		29.826 - 29.973	95658	2435	.00072
32		29.974 - 30.120	114484	2451	-.00737
33		30.121 - 30.268	87028	1491	-.00424
34		30.269 - 30.563	57127	792	-.00235
35	Temperature (°F)	- ∞ - 4	1017	18	-.02170
36		5 - 14	3611	58	-.02073
37		15 - 24	24504	285	-.02695
38		25 - 34	53098	1014	-.02727
39		35 - 39	31961	1058	-.02200
40		40 - 44	31784	831	-.02483
41		45 - 49	37271	864	-.02842
42		50 - 54	36040	644	-.02838
43		55 - 59	35556	608	-.02789
44		60 - 64	39191	872	-.02590

Table 2. Continued.

Index	Element	Category	ΣZ	ΣZY	A10
45	Temperature (°F) cont.	65 - 74	72758	1291	-.02615
46		75 - 84	41673	606	-.02352
47		85 - 94	13241	195	-.02291
48	Dew point depression (°F)	0 - 1	35160	3078	.01576
49		2 - 7	158036	2631	-.00596
50		8 - 15	123263	1319	-.00516
51		16 - 25	80188	966	-.00755
52	Wind speed (kt)	0 - 1	18824	515	-.00059
53		2 - 9	336487	7027	.00002
54		10 - 19	61939	757	.00786
55		20 - 29	4497	49	.00863
56	Wind direction (deg)	00 - 44	33661	908	.00732
57		45 - 89	20748	405	-.00231
58		90 - 134	30569	475	-.00842
59		135 - 179	52449	1330	.00084
60		180 - 224	77072	1639	-.00207
61		225 - 269	33438	556	-.00027
62		270 - 314	95727	1475	-.00166
63	Precipitation amount (inches)	.002 - .100	60	1	-.05164
64		.001 - .0019	1001	35	-.01552
65	Precipitation occurrence (Y,N)	Yes	17977	728	-.00049
66	Frozen precipitation (Y,N) (when successfully measured)	Yes	0	0	.00000
67	Month	January	41688	827	-.00622
68		February	37552	724	-.00061
69		March	41750	493	-.00561
70		April	46108	646	-.00416
71		May	25387	506	.00000
72		June	30418	598	-.00455
73		July	28260	451	-.00761
74		August	16613	268	-.00082
75		September	35484	492	-.00524
76		October	37036	1023	-.00028
77		November	40638	788	-.00592
78	Hour (LST)	00 - 00	34956	765	-.00519
79		02 - 03	34553	860	-.00930
80		04 - 05	30464	769	-.00292
81		06 - 07	34371	892	-.00599
82		08 - 09	35620	896	.00209
83		10 - 11	35667	544	-.00026
84		12 - 13	35739	431	-.00680
85		14 - 15	36019	514	-.00312
86		16 - 17	36549	648	-.00340
87		18 - 19	36459	673	.00004
88		20 - 21	36137	639	-.00078

Table 3. Brier scores for a 10-minute forecast of each specified predictand using the global climatological probability, the conditional persistence probability, and GEM based on the developmental sample of 468408 cases. Dashes denote inapplicability.

Index	Element	Category	Climatology	Persistence	GEM
1	(Always unity)				
2	Lowest cloud hit (00')	0 - 1	.01940	.01810	.01657
3		2 - 4	.04848	.03827	.03075
4		5 - 9	.03551	.02896	.02547
5		10 - 29	.07399	.04296	.03680
6		30 - 60	.08152	.04617	.04139
7	Second cloud hit (00')	0 - 1	.05442	.04379	.04131
8		2 - 4	.02923	.01349	.01254
9		5 - 9	.02495	.01571	.01410
10		10 - 29	.06237	.02857	.02549
11		30 - 60	.07045	.03622	.03229
12	Third cloud hit (00')	0 - 1	.02962	.02614	.02474
13		2 - 4	.02575	.01134	.00963
14		5 - 9	.02342	.01435	.01273
15		10 - 29	.05769	.02610	.02327
16		30 - 60	.06244	.03164	.02820
17	Fourth cloud hit (00')	0 - 1	.00143	.00134	.00128
18		2 - 4	.02208	.01004	.00877
19		5 - 9	.02225	.01338	.01206
20		10 - 29	.05226	.02445	.02207
21		30 - 60	.05344	.02811	.02561
22	Visibility (Miles)	0 - 31/64	.05010	.03554	.03419
23		1/2 - 63/64	.07108	.05299	.05018
24		1 - 2 63/64	.03714	.01902	.01774
25		3 - 4 63/64	.06538	.03551	.03262
26		5 - 6 63/64	.06322	.04045	.03885
27	Station pressure (inches of Hg)	0 - 29.235	.00056	.00013	.00013
28		29.236 - 29.530	.01247	.00065	.00064
29		29.531 - 29.677	.02501	.01842	.01830
30		29.678 - 29.825	.09997	.06048	.06009
31		29.826 - 29.973	.01754	.01035	.01029
32		29.974 - 30.120	.01977	.01104	.01099
33		30.121 - 30.268	.01637	.09078	.09041
34		30.269 - 30.563	.11714	.00417	.00415
35	Temperature (°F)	-∞ - 4	.00241	.00008	.00008
36		5 - 14	.00847	.00131	.00130
37		15 - 24	.05462	.00840	.00822
38		25 - 34	.11007	.01693	.01641
39		35 - 39	.07000	.01897	.01850
40		40 - 44	.06987	.02013	.01950
41		45 - 49	.08046	.02240	.02161
42	Temperature (°F) cont.	50 - 54	.07818	.02308	.02230
43		55 - 59	.07711	.02287	.02214
44		60 - 64	.08436	.02350	.02290

Table 3. Continued.

Index	Element	Category	Climatology	Persistence	GEM
45		65 - 74	.14279	.02181	.02122
46		75 - 84	.08891	.01359	.01332
47		85 - 94	.03042	.00423	.00412
48	Dew point depression (°F)	0 - 1	.07640	.03393	.03126
49		2 - 7	.23428	.07114	.06557
50		8 - 15	.20686	.06386	.06252
51		16 - 25	.15397	.03901	.03787
52	Wind speed (kt)	0 - 1	.04304	.03518	.03385
53		2 - 9	.16165	.09348	.08612
54		10 - 19	.12539	.06327	.05878
55		20 - 29	.01047	.00775	.00744
56	Wind direction (deg)	00 - 44	.07360	.05026	.04757
57		45 - 89	.04668	.03327	.03202
58		90 - 134	.06719	.04270	.04116
59		135 - 179	.10876	.06754	.06411
60		180 - 224	.14962	.07513	.06896
61		225 - 269	.07313	.05558	.05391
62		270 - 314	.17534	.09554	.08856
63	Precipitation amount (inches)	.002 - .100	.00011	.00011	.00011
64		.001 - .0019	.00238	.00232	.00226
65	Precipitation Occurrence (Y,N)	Yes	.04088	.01804	.01773
66	Frozen precipitation (Y,N) (when successfully measured)	Yes	-	-	-
67	Month	January	-	-	-
68		February	-	-	-
69		March	-	-	-
70		April	-	-	-
71		May	-	-	-
72		June	-	-	-
73		July	-	-	-
74		August	-	-	-
75		September	-	-	-
76		October	-	-	-
77		November	-	-	-
78	Hour (LST)	00 - 00	-	-	-
79		02 - 03	-	-	-
80		04 - 05	-	-	-
81		06 - 07	-	-	-
82		08 - 09	-	-	-
83		10 - 11	-	-	-
84		12 - 13	-	-	-
85		14 - 15	-	-	-
86		16 - 17	-	-	-
87		18 - 19	-	-	-
88		20 - 21	-	-	-

Table 4. A summarization of the comparative skill between GEM, "G", and persistence, "P", (ties are denoted by "T") for appropriate scores at projections of 10, 20, ..., 60 minutes with a tally for each. Percent correct (PC), Heidke skill score (H), and threat score (T) are shown for the predictands listed in section 2.2, except precipitation occurrence. The actual data from which this table was constructed is shown on pages 19-91.

		10	20	30	40	50	60	
H ₁	PC	G	G	G	G	G	G	
	H	G	G	G	G	G	G	
	T	G	G	G	G	G	G	
H ₂	PC	G	G	G	G	G	G	
	H	P	P	P	P	P	P	
	T	G	G	G	G	G	G	
H ₃	PC	G	P	G	P	P	P	
	H	G	P	P	P	P	P	
	T	G	G	G	G	G	G	
H ₄	PC	P	P	P	P	P	P	
	H	P	P	P	P	P	P	
	T	G	G	P	G	G	G	
V	PC	T	G	G	G	G	G	
	H	T	G	G	G	G	G	
	T	T	T	T	T	T	T	
P	PC	T	T	T	T	T	T	
	G	T	T	T	T	T	T	
	T	T	T	T	T	T	T	
T	PC	T	T	G	G	G	G	
	H	T	T	G	G	G	G	
	T	T	T	G	G	G	G	
DPD	PC	T	P	G	G	G	G	
	H	T	P	G	G	G	G	
	T	T	P	G	G	G	G	
WS	PC	T	G	G	G	G	G	
	H	T	G	G	G	G	G	
	T	T	G	G	G	G	G	
WD	PC	T	P	P	P	P	P	
	H	T	P	P	P	P	P	
	T	T	P	P	P	P	P	
PA	PC	T	T	T	G	G	G	
	H	T	T	T	G	P	P	
	T	T	T	T	G	P	P	
Total	G	9	11	15	17	16	16	84
	P	3	9	7	7	8	8	42
	T	15	7	5	3	3	3	36

GEM Results

GEM VERSUS VERIFYING OBSERVATION AT 10 MINUTE INTERVALS

LOWEST CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	193	74	3	1	2	78	351
2 - 4	90	942	218	32	18	85	1385
5 - 9	10	262	823	195	47	163	1500
10 - 29	22	125	402	3658	196	726	5129
30 - 60	31	91	79	449	2723	1072	4445
61 - UNL	1349	2530	1777	2738	2146	78962	89502
COLUMN TOTALS:	1695	4024	3302	7073	5132	81086	102312
BIASFS:	.21	.34	.45	.73	.87	1.10	

PERCENT CORRECT: 85.33
 HEIDKE SKILL SCORE: .5109
 CHI-SQUARE: 5279.56
 THREAT SCORE: .2110

SECOND CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	75	47	0	0	0	90	212
2 - 4	62	824	221	34	8	78	1227
5 - 9	8	196	784	215	34	164	1401
10 - 29	0	57	262	3415	224	882	4840
30 - 60	4	35	48	337	2288	1063	3775
61 - UNL	65	172	300	1104	1340	87876	90857
COLUMN TOTALS:	214	1331	1615	5105	3894	90153	102312
BIASFS:	.99	.92	.87	.95	.97	1.01	

PERCENT CORRECT: 93.11
 HEIDKE SKILL SCORE: .6770
 CHI-SQUARE: 59.39
 THREAT SCORE: .5101

THIRD CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	25	51	0	0	0	74	150
2 - 4	29	700	222	31	8	86	1076
5 - 9	1	137	755	206	21	202	1322
10 - 29	0	29	186	3074	221	968	4478
30 - 60	2	17	28	213	1874	1011	3145
61 - UNL	33	92	206	945	1021	89844	92141
COLUMN TOTALS:	90	1026	1397	4469	3145	92185	102312
BIASES:	1.67	1.05	.95	1.00	1.00	1.00	

PERCENT CORRECT: 94.10

HEIDKE SKILL SCORE: .6816

CHI-SQUARE: 46.50

THREAT SCORE: .5237

FOURTH CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	2	24	1	0	0	63	90
2 - 4	8	535	243	29	3	114	932
5 - 9	0	110	636	140	12	267	1165
10 - 29	0	18	188	2310	195	983	3694
30 - 60	0	12	26	222	1291	986	2537
61 - UNL	6	59	165	858	869	91937	93894
COLUMN TOTALS:	16	758	1259	3559	2370	94350	102312
BIASES:	5.63	1.23	.93	1.04	1.07	1.00	

PERCENT CORRECT: 94.53

HEIDKE SKILL SCORE: .6390

CHI-SQUARE: 408.30

THREAT SCORE: .4637

VISIBILITY (MILES)

VERIFYING OBSERVATION

	0 - 31/64	1/2 - 63/64	1 - 2 63/64	3 - 4 63/64	5 - 6 63/64	7 - 100	ROW TOTALS
0 - 31/64	345	89	109	65	35	40	683
1/2 - 63/64	94	127	167	75	21	39	523
1 - 2 63/64	95	186	2963	1047	166	117	4574
3 - 4 63/64	63	67	981	4040	1147	449	6747
5 - 6 63/64	37	28	186	1142	3449	1738	6580
7 - 100	39	25	137	396	1788	80820	83205
COLUMN TOTALS:	673	522	4543	6765	6606	83203	102312
BIASES:	1.02	1.00	1.01	1.00	1.00	1.00	

PERCENT CORRECT: 89.67
 HEIDKE SKILL SCORE: .6852
 CHI-SQUARE: .51
 THREAT SCORE: .3751

STATION PRESSURE (INCHES OF Hg)

VERIFYING OBSERVATION

	0 - 29.235	29.236 - 29.530	29.531 - 29.677	29.678 - 29.825	29.826 - 29.973	29.974 - 30.120	30.121 - 30.268	30.269 - 30.563	30.564 - 35.000	ROW TOTALS
0 - 29.235	0	0	0	0	0	0	0	0	0	0
29.236 - 29.530	0	1860	22	0	0	0	0	0	0	1882
29.531 - 29.677	0	22	3499	114	0	0	0	0	0	3635
29.678 - 29.825	0	0	114	18558	412	0	0	0	0	19084
29.826 - 29.973	0	0	0	389	42318	280	0	0	0	42987
29.974 - 30.120	0	0	0	0	282	30240	57	0	0	30579
30.121 - 30.268	0	0	0	0	0	73	3846	11	0	3930
30.269 - 30.563	0	0	0	0	0	0	11	204	0	215
30.564 - 35.000	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	0	1882	3635	19061	43012	30593	3914	215	0	102312
BIASES:	99.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	99.99	

PERCENT CORRECT: 98.25
 HEIDKE SKILL SCORE: .9749
 CHI-SQUARE: .11

TEMPERATURE (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	-30 -	4	5 -	14	15 -	24	25 -	34	35 -	40 -	45 -	50 -	55 -	60 -	65 -	74	75 -	84	85 -	94	95 -	110	ROW TOTALS
-30 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 - 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 - 34	0	0	0	0	0	0	59	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69
35 - 39	0	0	0	0	0	0	2	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86
40 - 44	0	0	0	0	0	0	0	13	674	162	0	0	0	0	0	0	0	0	0	0	0	0	849
45 - 49	0	0	0	0	0	0	0	0	170	2684	312	3799	574	0	0	0	0	0	0	0	0	0	3166
50 - 54	0	0	0	0	0	0	0	0	0	296	0	554	7663	773	0	0	0	0	0	0	0	0	4669
55 - 59	0	0	0	0	0	0	0	0	0	0	0	7	744	14230	1394	0	0	0	0	0	0	0	8990
60 - 64	0	0	0	0	0	0	0	0	0	0	0	0	3	1340	31245	1176	0	0	0	0	0	0	16375
65 - 74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1181	24358	711	0	0	0	0	0	33764
75 - 84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	706	7352	15	0	0	0	0	26250
85 - 94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	8075
95 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	19
COLUMN TOTALS:	99.99	99.99	99.99	99.99	99.99	99.99	1.13	1.04	83	868	3142	4672	8984	16343	33822	26240	8078	19	1.00	1.00	1.00	1.00	102312
BIASES:																							

PERCENT CORRECT: 90.05
 HEIDKE SKILL SCORE: .8728
 CHI-SQUARE: 1.93

DEW POINT DEPRESSION (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	0 - 1	2 - 7	8 - 15	16 - 25	26 - 99	ROW TOTALS
0 - 1	7211	2813	0	0	0	10024
2 - 7	2825	34155	1687	0	0	38667
8 - 15	0	1728	23654	1416	0	26798
16 - 25	0	1	1416	18641	512	20570
26 - 99	0	0	0	526	5727	6253
COLUMN TOTALS:	10036	38697	26757	20583	6239	102312
BIASES:	1.00	1.00	1.00	1.00	1.00	

PERCENT CORRECT: 87.37%
 HEIDKE SKILL SCORE: .8281
 CHI-SQUARE: .14

WIND SPEED (KT)

VERIFYING OBSERVATION

	0 - 1	2 - 9	10 - 19	20 - 29	30 - 99	ROW TOTALS
GEM	1013	2766	1	0	0	3780
FORECAST	2835	79953	3927	2	0	86717
	0	3933	7577	138	0	11648
	0	2	139	26	0	167
	0	0	0	0	0	0
COLUMN TOTALS:	3848	86654	11644	166	0	102312
BIASES:	.98	1.00	1.00	1.01	99.99	

PERCENT CORRECT: 86.57%
 HEIDKE SKILL SCORE: .4984
 CHI-SQUARE: 1.25

WIND DIRECTION (DEG)

VERIFYING OBSERVATION

	00 - 44	45 - 89	90 - 134	135 - 179	180 - 224	225 - 269	270 - 314	315 - 359	ROW TOTALS
GEM	5407	1115	202	85	53	68	324	1894	9148
FORECAST	943	3426	847	123	50	81	190	309	5969
	187	816	2614	889	260	150	170	123	5209
	71	52	660	8458	3527	308	288	130	13494
	76	80	287	3176	17481	1876	616	200	23792
	88	74	229	377	1852	5465	2158	218	10461
	262	161	177	297	533	2172	13671	2673	19946
	2089	256	209	160	127	234	2512	8706	14293
COLUMN TOTALS:	9123	5980	5225	13565	23883	10354	19929	14253	102312
BIASES:	1.00	1.00	1.00	1.00	1.00	1.01	1.00	1.00	

PERCENT CORRECT: 63.75%
 HEIDKE SKILL SCORE: .5718
 CHI-SQUARE: 2.09

PRECIPITATION AMOUNT (INCHES)

		VERIFYING OBSERVATION				ROW TOTALS
		.002 - .100	.001 - .0019	.000 - .0009		
GEM	.002 - .100	0	1	17	18	
FORECAST	.001 - .0019	0	7	135	142	
	.000 - .0009	17	138	101997	102152	
COLUMN TOTALS:		17	146	102149	102312	
BIASES:		1.06	.97	1.00		
PERCENT CORRECT:	99.70%					
HEIDKE. SKILL SCORE:	.0451					
CHI-SQUARE:	.17					

PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION			ROW TOTALS
		YES	NO		
GEM FORECAST	YES	0	0		0
	NO	0	102312		102312
COLUMN TOTALS:		0	102312		102312
BIASES:		99.99	1.00		
PERCENT CORRECT: 100.00%					
HEIDKE SKILL SCORE: 1.0000					
CHI-SQUARE: 0.00					
THREAT SCORE: *****					

FROZEN PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
GEM FORECAST	YES	0	0	0
	NO	0	102312	102312
COLUMN TOTALS:		0	102312	102312
BIASES:		99.99	1.00	
PERCENT CORRECT: 100.00%				
HEIDKE SKILL SCORE: 1.0000				
CHI-SQUARE: 0.00				
THREAT SCORE: *****				

GEM VERSUS VERIFYING OBSERVATION AT 20 MINUTE INTERVALS

LOWEST CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	203	99	21	4	3	100	430
2 - 4	90	870	393	53	28	102	1536
5 - 9	10	194	603	210	51	180	1248
10 - 29	27	130	394	3340	227	900	5018
30 - 60	34	102	91	461	2402	1239	4329
61 - UNL	1283	2488	1738	2810	2237	76181	86737
COLUMN TOTALS:	1647	3883	3240	6878	4948	78702	99298
BIASES:	.26	.40	.39	.73	.88	1.10	

PERCENT CORRECT: 84.19
 HFIDKF SKILL SCORE: .4746
 CHI-SQUARE: 4943.33
 THREAT SCORE: .2024

SECOND CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	58	44	1	0	0	105	208
2 - 4	81	710	248	51	14	102	1206
5 - 9	2	220	707	211	40	180	1360
10 - 29	1	60	274	3070	236	1062	4703
30 - 60	2	48	51	386	1918	1130	3535
61 - UNL	63	192	320	1235	1546	84930	88286
COLUMN TOTALS:	207	1274	1601	4953	3754	87509	99298
BIASES:	1.01	.95	.85	.95	.94	1.01	

PERCENT CORRECT: 92.04
 HFIDKF SKILL SCORE: .6251
 CHI-SQUARE: 72.21
 THREAT SCORE: .4461

THIRD CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	21	45	1	0	0	128	195
2 - 4	35	608	268	43	11	123	1088
5 - 9	1	141	664	199	23	224	1252
10 - 29	0	19	182	2779	230	1184	4394
30 - 60	1	35	35	264	1604	1078	3017
61 - UNL	27	128	234	1056	1175	86732	89352
COLUMN TOTALS:	85	976	1384	4341	3043	89469	99298
BIASES:	2.29	1.12	.91	1.01	.99	1.00	

PERCENT CORRECT: 93.06
 HEIDKE SKILL SCORE: .6271
 CHI-SQUARE: 168.82
 THREAT SCORE: .4336

FOURTH CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	2	21	0	0	0	66	89
2 - 4	9	457	256	33	3	144	902
5 - 9	0	123	588	143	18	307	1179
10 - 29	0	18	195	2086	205	1147	3651
30 - 60	0	21	20	320	1089	1178	2628
61 - UNL	4	81	178	873	978	88735	90849
COLUMN TOTALS:	15	721	1237	3455	2293	91577	99298
BIASES:	5.93	1.25	.95	1.06	1.15	.99	

PERCENT CORRECT: 93.61
 HEIDKE SKILL SCORE: .5857
 CHI-SQUARE: 479.07
 THREAT SCORE: .3950

VISIBILITY (MILES)

VERIFYING OBSERVATION

	0 - 31/64	1/2 - 63/64	1 - 2 63/64	3 - 4 63/64	5 - 6 63/64	7 - 100	ROW TOTALS
GEM	261	71	118	79	29	53	611
FORECAST	86	75	159	75	19	36	450
	86	168	2566	1121	207	156	4304
	63	49	1022	3506	1168	646	6454
	32	24	233	1205	2935	1922	6351
	33	37	167	537	1994	78360	81128
COLUMN TOTALS:	561	424	4265	6523	6352	81173	99298
BIASES:	1.09	1.06	1.01	.99	1.00	1.00	

PERCENT CORRECT: 88.32
HEIDKE SKILL SCORE: .6372
CHI-SQUARE: 7.16
THREAT SCORE: .3175

STATION PRESSURE (INCHES OF Hg)

VERIFYING OBSERVATION

	0 - 29.235	29.236 - 29.530	29.531 - 29.677	29.678 - 29.825	29.826 - 29.973	29.974 - 30.120	30.121 - 30.268	30.269 - 30.563	30.564 - 35.000	ROW TOTALS
GEM	0	0	0	0	0	0	0	0	0	0
FORECAST	0	1792	38	0	0	0	0	0	0	1830
	0	34	3316	165	0	0	0	0	0	3515
	0	0	175	17825	577	0	0	0	0	18577
	0	0	0	539	40810	434	0	0	0	41783
	0	0	0	0	427	29034	105	0	0	29566
	0	0	0	0	0	131	3660	21	0	3812
	0	0	0	0	0	0	21	194	0	215
	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	0	1826	3529	18529	41814	29599	3786	215	0	99298
BIASES:	99.99	1.00	1.00	1.00	1.00	1.00	1.01	1.00	99.99	

PERCENT CORRECT: 97.31
HEIDKE SKILL SCORE: .9614
CHI-SQUARE: .43

TEMPERATURE (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	-30 -	5 -	15 -	25 -	35 -	40 -	45 -	50 -	55 -	60 -	65 -	75 -	85 -	95 -	ROW TOTALS
	4	14	24	34	39	44	49	54	59	64	74	84	94	110	
-30 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 - 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 - 34	0	0	0	41	18	0	0	0	0	0	0	0	0	0	59
35 - 39	0	0	0	31	31	36	0	0	0	0	0	0	0	0	67
40 - 44	0	0	0	12	576	194	0	0	0	0	0	0	0	0	782
45 - 49	0	0	0	217	2416	401	0	0	0	0	0	0	0	0	3034
50 - 54	0	0	0	0	363	3279	730	6954	1000	0	0	0	0	0	4373
55 - 59	0	0	0	0	4	677	897	13083	1802	0	0	0	0	0	8635
60 - 64	0	0	0	0	0	0	20	15	1675	29379	1710	0	0	0	15802
65 - 74	0	0	0	0	0	0	0	0	0	1	1727	23253	850	0	32779
75 - 84	0	0	0	0	0	0	0	0	0	0	4	851	7044	18	25831
85 - 94	0	0	0	0	0	0	0	0	0	0	0	0	18	1	7917
95 - 110	0	0	0	0	0	0	0	0	0	0	0	0	18	1	19
COLUMN TOTALS:	99.99	99.99	99.99	1.44	1.10	.94	1.02	1.00	1.01	1.00	1.00	1.00	1.00	1.00	99298
BIASES:															

PERCENT CORRECT: 86.67
HIT-TOKE SKILL SCORE: .8292
CHI-SQUARE: 13.09

DEW POINT DEPRESSION (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	0 - 1	2 - 7	8 - 15	16 - 25	26 - 99	ROW TOTALS
0 - 1	6905	2760	2	0	0	9667
2 - 7	2707	32168	2153	2	0	37030
8 - 15	0	2199	22225	1814	0	26238
16 - 25	0	13	1805	17707	650	20175
26 - 99	0	0	1	660	5527	6188
COLUMN TOTALS:	9612	37140	26186	20183	6177	99298
BIASES:	1.01	1.00	1.00	1.00	1.00	

PERCENT CORRECT: 85.13%
HIT-TOKE SKILL SCORE: .7980
CHI-SQUARE: .77

WIND SPEED (KT)

VERIFYING OBSERVATION

	0 - 1	2 - 9	10 - 19	20 - 29	30 - 99	ROW TOTALS
GEM	735	2806	4	0	0	3545
FORECAST	2853	76933	4311	2	0	84099
	1	4318	7033	136	0	11488
	0	2	138	26	0	166
	0	0	0	0	0	0
COLUMN TOTALS:	3589	84059	11486	164	0	99298
BIASES:	.99	1.00	1.00	1.01	99.99	

PERCENT CORRECT: 85.33%
 HEIDKE SKILL SCORE: .4532
 CHI-SQUARE: .58

WIND DIRECTION (DEG)

VERIFYING OBSERVATION

	00 - 44	45 - 89	90 - 134	135 - 179	180 - 224	225 - 269	270 - 314	315 - 359	ROW TOTALS
GEM	4693	1197	305	138	98	137	459	1911	8938
FORECAST	1019	2855	851	122	99	116	318	393	5773
	204	822	1962	889	405	222	281	211	4996
	118	96	603	7211	4044	461	400	164	13097
	130	114	366	3551	15567	2104	916	309	23057
	122	125	336	516	2017	4386	2257	337	10096
	352	224	312	562	779	2289	11960	2912	19390
	2225	374	293	252	185	298	2664	7660	13951
COLUMN TOTALS:	8863	5807	5028	13241	23194	10013	19255	13897	99298
BIASES:	1.01	.99	.99	.99	.99	1.01	1.01	1.00	

PERCENT CORRECT: 56.69%
 HEIDKE SKILL SCORE: .4883
 CHI-SQUARE: 5.26

PRECIPITATION AMOUNT (INCHES)

		VERIFYING OBSERVATION				ROW TOTALS
		.002 - .100	.001 - .0019	.000 - .0009		
GEM	.002 - .100	0	0	18		18
FORECAST	.001 - .0019	0	3	138		141
	.000 - .0009	17	140	98982		99139
COLUMN TOTALS:		17	143	99138		99298
BIASES:		1.06	.99	1.00		

PERCENT CORRECT: 99.68%
 HEIDKE SKILL SCORE: .0174
 CHI-SQUARE: .09

PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
GEM	YES	0	0	0
FORECAST	NO	0	99298	99298
COLUMN TOTALS:		0	99298	99298
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

FROZEN PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
GEM	YES	0	0	0
FORECAST	NO	0	99298	99298
COLUMN TOTALS:		0	99298	99298
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

GEM VERSUS VERIFYING OBSERVATION AT 30 MINUTE INTERVALS

LOWEST CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
GEM FORECAST							
0 - 1	202	126	34	5	5	116	488
2 - 4	85	792	468	78	35	137	1595
5 - 9	6	135	472	222	60	199	1094
10 - 29	37	121	427	3072	253	998	4908
30 - 60	27	125	117	455	2167	1283	4174
61 - UNL	1252	2454	1666	2871	2268	73722	84233
COLUMN TOTALS:	1609	3753	3184	6703	4788	76455	96492
BIASES:	.30	.43	.34	.73	.87	1.10	

PERCENT CORRECT: 83.35
 HEIDKE SKILL SCORE: .4479
 CHI-SQUARE: 4744.46
 THREAT SCORE: .1931

SECOND CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
GEM FORECAST							
0 - 1	64	26	6	0	1	106	203
2 - 4	81	623	258	72	13	132	1179
5 - 9	0	220	602	199	50	184	1255
10 - 29	1	53	315	2757	244	1068	4438
30 - 60	1	52	73	462	1751	1237	3576
61 - UNL	57	246	323	1330	1581	82304	85841
COLUMN TOTALS:	204	1220	1577	4820	3640	85031	96492
BIASES:	1.00	.97	.80	.92	.98	1.01	

PERCENT CORRECT: 91.30
 HEIDKE SKILL SCORE: .5898
 CHI-SQUARE: 106.25
 THREAT SCORE: .3946

THIRD CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	28	26	6	0	0	130	190
2 - 4	35	534	281	63	8	150	1071
5 - 9	1	150	563	215	37	226	1192
10 - 29	2	25	221	2542	239	1262	4291
30 - 60	0	32	50	265	1388	1020	2755
61 - UNL	18	164	239	1136	1284	84152	86993
COLUMN TOTALS:	84	931	1360	4221	2956	86940	96492
BIASES:	2.26	1.15	.88	1.02	.93	1.00	

PERCENT CORRECT: 92.45
 HEIDKE SKILL SCORE: .5910
 CHI-SQUARE: 190.43
 THREAT SCORE: .3769

FOURTH CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	1	10	3	0	0	72	86
2 - 4	10	394	247	54	2	205	912
5 - 9	0	126	518	166	20	302	1132
10 - 29	0	26	205	1884	204	1221	3540
30 - 60	0	16	34	276	990	1166	2482
61 - UNL	4	109	210	980	1008	86029	88340
COLUMN TOTALS:	15	681	1217	3360	2224	88995	96492
BIASES:	5.73	1.34	.93	1.05	1.12	.99	

PERCENT CORRECT: 93.08
 HEIDKE SKILL SCORE: .5494
 CHI-SQUARE: 464.75
 THREAT SCORE: .3245

VISIBILITY (MILFS)

VERIFYING OBSERVATION

	0 - 31/64	1/2 - 63/64	1 - 2 63/64	3 - 4 63/64	5 - 6 63/64	7 - 100	ROW TOTALS
0 - 31/64	205	50	126	75	28	72	556
1/2 - 63/64	72	36	152	75	30	40	405
GEM	81	158	2267	1200	223	179	4108
1 - 2 63/64	30	38	1030	3121	1173	773	6165
FORECAST	41	30	229	1190	2577	2067	6134
5 - 6 63/64	61	54	208	608	2089	76104	79124
7 - 100							
COLUMN TOTALS:	490	366	4012	6269	6120	79235	96492
BIASES:	1.14	1.11	1.02	.98	1.00	1.00	

PERCENT CORRECT: 87.38
 HEIDKE SKILL SCORE: .6013
 CHI-SQUARE: 17.26
 THREAT SCORE: .2497

STATION PRESSURE (INCHES OF Hg)

VERIFYING OBSERVATION

	0 - 29.235	29.236 - 29.530	29.531 - 29.677	29.678 - 29.825	29.826 - 29.973	29.974 - 30.120	30.121 - 30.268	30.269 - 30.563	30.564 - 35.000	ROW TOTALS
0 - 29.235	0	0	0	0	0	0	0	0	0	0
29.236 - 29.530	0	1731	49	0	0	0	0	0	0	1780
GEM	0	44	3133	219	0	0	0	0	0	3396
29.531 - 29.677	0	0	240	17151	724	0	0	0	0	18115
29.678 - 29.825	0	0	0	662	39410	581	0	0	0	40653
FORECAST	0	0	0	0	555	27918	155	0	0	28628
29.826 - 29.973	0	0	0	0	0	185	3489	31	0	3705
29.974 - 30.120	0	0	0	0	0	0	31	184	0	215
30.121 - 30.268	0	0	0	0	0	0	0	0	0	0
30.269 - 30.563	0	0	0	0	0	0	0	0	0	0
30.564 - 35.000	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	0	1775	3422	18032	40689	28684	3675	215	0	96492
BIASES:	99.99	1.00	.99	1.01	1.00	1.00	1.01	1.00	99.99	

PERCENT CORRECT: 96.40
 HEIDKE SKILL SCORE: .9482
 CHI-SQUARE: .98

TEMPERATURE (DEGREES FAHRENHEIT)

		VERIFYING OBSERVATION																ROW TOTALS	
		-30 -	5 -	15 -	25 -	35 -	40 -	45 -	50 -	55 -	60 -	65 -	75 -	85 -	95 -				
		4	14	24	34	39	44	49	54	59	64	74	84	94	110				
GEN FORECAST	-30 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	5 - 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	15 - 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	25 - 34	0	0	0	29	17	3	0	0	0	0	0	0	0	0	49			
	35 - 39	0	0	0	0	9	48	0	0	0	0	0	0	0	0	57			
	40 - 44	0	0	0	0	17	475	204	19	0	0	0	0	0	0	715			
	45 - 49	0	0	0	0	0	259	2208	467	10	0	0	0	0	0	2944			
	50 - 54	0	0	0	0	0	4	420	2757	911	14	0	0	0	0	4106			
	55 - 59	0	0	0	0	0	0	2	847	6194	1279	11	0	0	0	8333			
	60 - 64	0	0	0	0	0	0	0	37	1114	11729	2389	0	0	0	15269			
	65 - 74	0	0	0	0	0	0	0	0	37	2183	27298	2285	0	0	31803			
	75 - 84	0	0	0	0	0	0	0	0	0	2	2331	22006	1091	0	25430			
85 - 94	0	0	0	0	0	0	0	0	0	0	5	1110	6652	19	7786				
95 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
COLUMN TOTALS:		99.99	99.99	99.99	1.69	43	789	2834	4127	8266	15207	32034	25401	7743	19	96492			
BIASES:						1.33	.91	1.04	1.00	1.01	1.00	.99	1.00	1.01	0.00				

PERCENT CORRECT: 82.24
HEIDKE SKILL SCORE: .7722
CHI-SQUARE: 51.40

DEW POINT DEPRESSION (DEGREES FAHRENHEIT)

		VERIFYING OBSERVATION						ROW TOTALS	
		0 - 1	2 - 7	8 - 15	16 - 25	26 - 99			
GEN FORECAST	0 - 1	5656	2849	12	0	0	8517		
	2 - 7	3499	30195	2708	2	0	36404		
	8 - 15	2	2737	20588	2302	0	25629		
	16 - 25	0	25	2298	16666	823	19812		
	26 - 99	0	0	5	838	5287	6130		
COLUMN TOTALS:		9157	35806	25611	19808	6110	96492		
BIASES:		.93	1.02	1.00	1.00	1.00			

PERCENT CORRECT: 81.24%
HEIDKE SKILL SCORE: .7448
CHI-SQUARE: 54.80

WIND SPEED (KT)

VERIFYING OBSERVATION

	0 - 1	2 - 9	10 - 19	20 - 29	30 - 99	ROW TOTALS
GEM	591	2727	5	0	0	3323
FORECAST	2809	74445	4427	4	0	81685
	1	4421	6762	136	0	11320
	0	2	140	22	0	164
	0	0	0	0	0	0
COLUMN TOTALS:	3401	81595	11334	162	0	96492
BIASES:	.98	1.00	1.00	1.01	99.99	

PERCENT CORRECT: 84.79%
 HEIDKE SKILL SCORE: .4351
 CHI-SQUARE: 1.93

WIND DIRECTION (DEG)

VERIFYING OBSERVATION

	00 - 44	45 - 89	90 - 134	135 - 179	180 - 224	225 - 269	270 - 314	315 - 359	ROW TOTALS
GEM	4157	1218	388	168	125	189	508	1982	8735
FORECAST	1053	2484	856	167	130	157	360	387	5594
	247	834	1580	865	489	234	317	243	4809
	113	145	578	6332	4219	556	490	218	12651
	140	130	395	3803	14342	2155	1062	395	22422
	210	136	324	612	2183	3597	2181	339	9582
	406	262	438	689	856	2460	11031	2931	19073
	2275	426	291	248	211	315	2770	7090	13626
COLUMN TOTALS:	8601	5635	4850	12884	22555	9663	18719	13585	96492
BIASES:	1.02	.99	.99	.98	.99	.99	1.02	1.00	

PERCENT CORRECT: 52.45%
 HEIDKE SKILL SCORE: .4380
 CHI-SQUARE: 15.23

PRECIPITATION AMOUNT (INCHES)

		VERIFYING OBSERVATION				ROW TOTALS
		.002 - .100	.001 - .0019	.000 - .0009		
GEM	.002 - .100	0	0	18	18	
FORECAST	.001 - .0019	0	4	133	137	
	.000 - .0009	17	135	96185	96337	
COLUMN TOTALS:		17	139	96336	96492	
BIASES:		1.06	.99	1.00		

PERCENT CORRECT: 99.69%
 HEIDKE SKILL SCORE: .0244
 CHI-SQUARE: .09

PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION				ROW TOTALS
		YES	NO			
GEM FORECAST	YES	0	0			0
	NO	0	96492			96492
COLUMN TOTALS:		0	96492			96492
BIASES:		99.99	1.00			

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

FROZEN PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION				ROW TOTALS
		YES	NO			
GEM FORECAST	YES	0	0			0
	NO	0	96492			96492
COLUMN TOTALS:		0	96492			96492
BIASES:		99.99	1.00			

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

GEM VERSUS VERIFYING OBSERVATION AT 40 MINUTE INTERVALS

LOWEST CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL.	ROW TOTALS
0 - 1	241	297	85	17	14	183	837
2 - 4	37	536	449	88	33	140	1283
5 - 9	10	138	446	234	54	196	1078
10 - 29	28	143	423	2874	261	1044	4773
30 - 60	34	104	114	505	1981	1281	4019
61 - UNL.	1213	2419	1607	2841	2310	71507	81897
COLUMN TOTALS:	1563	3637	3124	6559	4653	74351	93887
BIASES:	.54	.35	.35	.73	.86	1.10	

PERCENT CORRECT: 82.64

HIT/DE SKILL SCORE: .4260

CHI-SQUARE: 4539.37

THREAT SCORE: .1789

SECOND CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL.	ROW TOTALS
0 - 1	52	37	10	0	2	100	201
2 - 4	84	538	295	69	22	159	1167
5 - 9	0	213	559	231	48	191	1242
10 - 29	4	76	314	2547	233	1167	4341
30 - 60	1	46	68	486	1584	1197	3382
61 - UNL.	54	249	310	1378	1652	79911	83554
COLUMN TOTALS:	195	1159	1556	4711	3541	82725	93887
BIASES:	1.03	1.01	.80	.92	.96	1.01	

PERCENT CORRECT: 90.74

HIT/DE SKILL SCORE: .5627

CHI-SQUARE: 108.11

THREAT SCORE: .3536

THIRD CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	17	29	7	0	1	130	184
2 - 4	38	435	304	63	7	178	1025
5 - 9	2	171	489	218	37	225	1142
10 - 29	2	39	246	2375	222	1333	4217
30 - 60	0	34	45	300	1202	969	2550
61 - UNL	21	169	244	1175	1406	81754	84769
COLUMN TOTALS:	80	877	1335	4131	2875	84589	93887
BIASES:	2.30	1.17	.86	1.02	.89	1.00	

PERCENT CORRECT: 91.89
 HEIDKE SKILL SCORE: .5579
 CHI-SQUARE: 226.99
 THREAT SCORE: .3151

FOURTH CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	1	10	3	0	0	67	81
2 - 4	8	318	261	59	2	233	881
5 - 9	0	132	464	186	29	310	1121
10 - 29	0	34	215	1779	188	1274	3490
30 - 60	0	23	27	321	931	1202	2504
61 - UNL	4	127	209	938	1009	83523	85810
COLUMN TOTALS:	13	644	1179	3283	2159	86609	93887
BIASES:	6.23	1.37	.95	1.06	1.16	.99	

PERCENT CORRECT: 92.68
 HEIDKE SKILL SCORE: .5271
 CHI-SQUARE: 521.32
 THREAT SCORE: .2629

VISIBILITY (MILES)

VERIFYING OBSERVATION

	0 - 31/64	1/2 - 63/64	1 - 2 63/64	3 - 4 63/64	5 - 6 63/64	7 - 100	ROW TOTALS
GEM	162	33	106	82	36	92	511
FORECAST	56	22	160	60	31	56	385
	93	153	2008	1217	277	203	3951
	29	46	1056	2800	1121	895	5947
	25	22	238	1226	2227	2141	5879
	76	53	230	652	2218	73985	77214
COLUMN TOTALS:	441	329	3798	6037	5910	77372	93887
BIASES:	1.16	1.17	1.04	.99	1.00	1.00	

PERCENT CORRECT: 86.49
 HFKF SKILL SCORE: .5677
 CHI-SQUARE: 28.63
 THREAT SCORE: .1960

STATION PRESSURE (INCHES OF Hg)

VERIFYING OBSERVATION

	0 - 29.235	29.236 - 29.530	29.531 - 29.677	29.678 - 29.825	29.826 - 29.973	29.974 - 30.120	30.121 - 30.268	30.269 - 30.563	30.564 - 35.000	ROW TOTALS
GEM	0	0	0	0	0	0	0	0	0	0
FORECAST	0	1672	59	0	0	0	0	0	0	1731
	0	54	2966	265	0	0	0	0	0	3285
	0	0	287	16515	858	0	0	0	0	17660
	0	0	0	758	38086	744	0	0	0	39588
	0	0	0	0	698	26902	203	0	0	27803
	0	0	0	0	0	236	3328	41	0	3605
	0	0	0	0	0	0	41	174	0	215
	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	0	1726	3312	17538	39642	27862	3572	215	0	93887
BIASES:	99.99	1.00	.99	1.01	1.00	1.00	1.01	1.00	99.99	

PERCENT CORRECT: 95.48
 HFKF SKILL SCORE: .9350
 CHI-SQUARE: 1.69

TEMPERATURE (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	-30 -	5 -	15 -	25 -	35 -	40 -	45 -	50 -	55 -	60 -	65 -	75 -	85 -	95 -	ROW TOTALS
	4	14	24	34	39	44	49	54	59	64	74	84	94	110	
-30 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 - 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 - 34	0	0	0	19	7	13	0	0	0	0	0	0	0	0	39
35 - 39	0	0	0	0	1	52	0	0	0	0	0	0	0	0	53
40 - 44	0	0	0	0	20	367	207	53	0	0	0	0	0	0	647
45 - 49	0	0	0	0	0	310	1988	519	55	0	0	0	0	0	2872
50 - 54	0	0	0	0	0	5	495	2246	1030	87	0	0	0	0	3863
55 - 59	0	0	0	0	0	0	15	1010	5503	1507	53	0	0	0	8088
60 - 64	0	0	0	0	0	0	2	67	1350	10408	2935	0	0	0	14762
65 - 74	0	0	0	0	0	0	0	0	55	2670	25297	2855	0	0	30877
75 - 84	0	0	0	0	0	0	0	0	0	8	2950	20754	1309	0	25021
85 - 94	0	0	0	0	0	0	0	0	0	0	12	1358	6276	19	7665
95 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	0	0	0	19	28	747	2707	3895	7993	14680	31247	24967	7585	19	93887
BIASES:	99.99	99.99	99.99	2.05	1.89	.87	1.06	.99	1.01	1.01	.99	1.00	1.01	0.00	

PERCENT CORRECT: 77.60
HEIDKE SKILL SCORE: .7123
CHI-SQUARE: 93.01

DEW POINT DEPRESSION (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	0 - 1	2 - 7	8 - 15	16 - 25	26 - 99	ROW TOTALS
0 - 1	3867	2598	15	0	0	6480
2 - 7	4877	28679	3281	4	0	36841
8 - 15	2	3229	19017	2762	1	25011
16 - 25	0	64	2748	15676	986	19474
26 - 99	0	0	20	999	5062	6081
COLUMN TOTALS:	8746	34570	25081	19441	6049	93887
BIASES:	.74	1.07	1.00	1.00	1.01	

PERCENT CORRECT: 77.01%
HEIDKE SKILL SCORE: .6854
CHI-SQUARE: 736.71

WIND SPEED (KT)

VERIFYING OBSERVATION

	0 - 1	2 - 9	10 - 19	20 - 29	30 - 99	ROW TOTALS
GEM	547	2608	0	0	0	3155
FORECAST	2651	72262	4504	3	0	79420
	3	4482	6523	140	0	11148
	0	2	144	18	0	164
	0	0	0	0	0	0
COLUMN TOTALS:	3201	79354	11171	161	0	93887
BIASES:	.99	1.00	1.00	1.02	99.99	

PERCENT CORRECT: 84.52%
 HFIDKF SKILL SCORE: .4260
 CHI-SQUARE: .82

WIND DIRECTION (DEG)

VERIFYING OBSERVATION

	00 - 44	45 - 89	90 - 134	135 - 179	180 - 224	225 - 269	270 - 314	315 - 359	ROW TOTALS
GEM	3817	1215	446	203	146	228	553	1931	8539
FORECAST	1021	2256	870	143	159	180	389	474	5492
	268	862	1298	870	525	213	391	216	4643
	156	133	558	5624	4206	658	579	295	12209
	163	181	406	3890	13552	2178	1095	435	21900
	220	161	317	770	2159	2738	2132	363	8860
	472	256	492	747	944	2774	10298	3005	18988
	2294	450	315	268	240	349	2793	6547	13256
COLUMN TOTALS:	8411	5514	4702	12515	21931	9318	18230	13266	93887
BIASES:	1.02	1.00	.99	.98	1.00	.95	1.04	1.00	

PERCENT CORRECT: 49.13%
 HFIDKF SKILL SCORE: .3984
 CHI-SQUARE: 64.34

PRECIPITATION AMOUNT (INCHES)

VERIFYING OBSERVATION

.002 - .100 .001 - .0019 .000 - .0009 ROW TOTALS

GEM .002 - .100 0 0 0 0
 FORECAST .001 - .0019 0 4 118
 .000 - .0009 17 130 93618 93765

COLUMN TOTALS: 17 134 93736 93887
 BIASES: 0.00 .91 1.00

PERCENT CORRECT: 99.72%
 HEIDKE SKILL SCORE: .026
 CHI-SQUARE: 18.08

PRECIPITATION OCCURENCE (Y OR N)

VERIFYING OBSERVATION

YES NO ROW TOTALS

GEM YES 0 0 0
 FORECAST NO 0 93887 93887

COLUMN TOTALS: 0 93887 93887
 BIASES: 99.99 1.00

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

FROZEN PRECIPITATION OCCURENCE (Y OR N)

VERIFYING OBSERVATION

YES NO ROW TOTALS

GEM YES 0 0 0
 FORECAST NO 0 93887 93887

COLUMN TOTALS: 0 93887 93887
 BIASES: 99.99 1.00

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

GEM VERSUS VERIFYING OBSERVATION AT 50 MINUTE INTERVALS

LOWEST CLOUD HIT (00')

		VERIFYING OBSERVATION							ROW TOTALS
		0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL		
GEM FORECAST	0 - 1	226	290	126	24	33	254	953	
	2 - 4	35	501	492	105	28	157	1318	
	5 - 9	12	109	328	255	48	184	936	
	10 - 29	45	154	449	2680	256	1084	4668	
	30 - 60	30	101	109	550	1823	1277	3890	
61 - UNL		1182	2371	1573	2840	2319	69368	79653	
COLUMN TOTALS:		1530	3526	3077	6454	4507	72324	91418	
BIASES:		.62	.37	.30	.72	.86	1.10		

PERCENT CORRECT: 81.96
 HEIDKE SKILL SCORE: .4064
 CHI-SQUARE: 4411.38
 THREAT SCORE: .1676

SECOND CLOUD HIT (00')

		VERIFYING OBSERVATION							ROW TOTALS
		0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL		
GEM FORECAST	0 - 1	31	35	11	0	3	99	179	
	2 - 4	90	454	315	82	26	185	1152	
	5 - 9	2	225	518	224	42	196	1207	
	10 - 29	2	79	334	2411	232	1180	4238	
	30 - 60	4	44	66	519	1437	1190	3260	
	61 - UNL	57	261	300	1412	1690	77662	81382	
COLUMN TOTALS:		186	1098	1544	4648	3430	80512	91418	
BIASFS:		.96	1.05	.78	.91	.95	1.01		

PERCENT CORRECT: 90.26
 HEIDKE SKILL SCORE: .5403
 CHI-SQUARE: 130.47
 THREAT SCORE: .3042

THIRD CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	5	15	6	0	2	52	80
2 - 4	42	366	315	80	12	273	1088
5 - 9	2	184	459	205	35	227	1112
10 - 29	0	38	262	2254	230	1341	4125
30 - 60	2	30	58	335	1075	1006	2506
61 - UNL	23	187	221	1199	1433	79444	82507
COLUMN TOTALS:	74	820	1321	4073	2787	82343	91418
BIASES:	1.08	1.33	.84	1.01	.90	1.00	

PERCENT CORRECT: 91.45
 HEIDKE SKILL SCORE: .5352
 CHI-SQUARE: 150.47
 THREAT SCORE: .2619

FOURTH CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	1	1	1	0	1	12	16
2 - 4	7	276	281	66	4	348	982
5 - 9	0	132	424	181	23	298	1058
10 - 29	0	26	233	1651	202	1298	3410
30 - 60	1	19	32	370	833	1272	2527
61 - UNL	3	146	187	964	1040	81085	83425
COLUMN TOTALS:	12	600	1158	3232	2103	84313	91418
BIASES:	1.33	1.64	.91	1.06	1.20	.99	

PERCENT CORRECT: 92.18
 HEIDKE SKILL SCORE: .4994
 CHI-SQUARE: 357.82
 THREAT SCORE: .2151

VISIBILITY (MILES)

VERIFYING OBSERVATION

	0 - 31/64	1/2 - 63/64	1 - 2 63/64	3 - 4 63/64	5 - 6 63/64	7 - 100	ROW TOTALS
0 - 31/64	114	32	101	88	25	134	494
1/2 - 63/64	54	10	133	72	40	68	377
1 - 2 63/64	101	151	1834	1179	297	264	3826
3 - 4 63/64	35	44	1071	2496	1053	1031	5730
5 - 6 63/64	23	29	228	1224	1936	2205	5645
7 - 100	68	44	251	730	2366	71887	75346
COLUMN TOTALS:	395	310	3618	5789	5717	75589	91418
BIASES:	1.25	1.22	1.06	.99	.99	1.00	

PERCENT CORRECT: 85.63
 HEIDKE SKILL SCORE: .5348
 CHI-SQUARE: 53.54
 THREAT SCORE: .1537

STATION PRESSURE (INCHES OF Hg)

VERIFYING OBSERVATION

	0 - 29.235	29.236 - 29.530	29.531 - 29.677	29.678 - 29.825	29.826 - 29.973	29.974 - 30.120	30.121 - 30.268	30.269 - 30.563	30.564 - 35.000	ROW TOTALS
0 - 29.235	0	0	0	0	0	0	0	0	0	0
29.236 - 29.530	0	1622	69	0	0	0	0	0	0	1691
29.531 - 29.677	0	64	2814	310	0	0	0	0	0	3188
29.678 - 29.825	0	0	327	15925	961	0	0	0	0	17213
29.826 - 29.973	0	0	0	817	36862	889	0	0	0	38568
29.974 - 30.120	0	0	0	0	823	25972	243	0	0	27038
30.121 - 30.268	0	0	0	0	0	286	3168	51	0	3505
30.269 - 30.563	0	0	0	0	0	0	51	164	0	215
30.564 - 35.000	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	0	1686	3210	17052	38646	27147	3462	215	0	91418
BIASES:	99.99	1.00	.99	1.01	1.00	1.00	1.01	1.00	99.99	

PERCENT CORRECT: 94.65
 HEIDKE SKILL SCORE: .9231
 CHI-SQUARE: 2.81

TEMPERATURE (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	-30 -	5 -	15 -	25 -	35 -	40 -	45 -	50 -	55 -	60 -	65 -	75 -	85 -	95 -	ROW TOTALS
	4	14	24	34	39	44	49	54	59	64	74	84	94	110	
-30 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 - 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 - 34	0	0	0	9	0	20	0	0	0	0	0	0	0	0	29
35 - 39	0	0	0	0	0	45	8	0	0	0	0	0	0	0	53
40 - 44	0	0	0	0	19	288	194	85	0	0	0	0	0	0	586
45 - 49	0	0	0	0	0	349	1769	548	131	1	0	0	0	0	2798
50 - 54	0	0	0	0	0	5	573	1876	982	207	0	0	0	0	3643
55 - 59	0	0	0	0	0	0	30	1117	5002	1567	150	0	0	0	7866
60 - 64	0	0	0	0	0	0	6	92	1512	9302	3388	0	0	0	14300
65 - 74	0	0	0	0	0	0	0	0	94	3064	23479	3355	0	0	29992
75 - 84	0	0	0	0	0	0	0	0	0	15	3471	19604	1505	0	24595
85 - 94	0	0	0	0	0	0	0	0	0	0	19	1576	5942	19	7556
95 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	0	0	0	9	19	707	2580	3718	7721	14156	30507	24535	7447	19	91418
BIASES:	99.99	99.99	99.99	3.22	2.79	.83	1.08	.98	1.02	1.01	.98	1.00	1.02	0.00	

PERCENT CORRECT: 73.59
HEIDKE SKILL SCORE: .6603
CHI-SQUARE: 179.55

DEW POINT DEPRESSION (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	0 - 1	2 - 7	8 - 15	16 - 25	26 - 99	ROW TOTALS
0 - 1	3244	2802	30	0	0	6076
2 - 7	5129	26865	3727	16	0	35737
8 - 15	18	3590	17600	3228	6	24442
16 - 25	0	132	3193	14678	1130	19133
26 - 99	0	0	40	1136	4854	6030
COLUMN TOTALS:	8391	33389	24590	19058	5990	91418
BIASES:	.72	1.07	.99	1.00	1.01	

PERCENT CORRECT: 73.55%
HEIDKE SKILL SCORE: .6383
CHI-SQUARE: 805.26

WIND SPEED (KT)

VERIFYING OBSERVATION

	0 - 1	2 - 9	10 - 19	20 - 29	30 - 99	ROW TOTALS
0 - 1	498	2521	5	0	0	3024
2 - 9	2536	70103	4642	4	0	77285
10 - 19	5	4620	6184	138	0	10947
20 - 29	0	1	142	19	0	162
30 - 99	0	0	0	0	0	0
COLUMN TOTALS:	3039	77245	10973	161	0	91418
BIASES:	1.00	1.00	1.00	1.01	99.99	

PERCENT CORRECT: 84.01%
 HEIDKEF SKILL SCORE: .4083
 CHI-SQUARE: .16

WIND DIRECTION (DEG)

VERIFYING OBSERVATION

	00 - 44	45 - 89	90 - 134	135 - 179	180 - 224	225 - 269	270 - 314	315 - 359	ROW TOTALS
00 - 44	3608	1163	485	206	168	217	627	1930	8404
45 - 89	986	2159	866	188	139	238	411	408	5395
90 - 134	327	730	1136	777	543	219	394	251	4377
135 - 179	172	217	495	5148	4249	702	581	323	11887
180 - 224	200	200	448	3972	12875	2130	1111	406	21342
225 - 269	188	181	279	838	2052	2415	2048	379	8380
270 - 314	622	271	495	792	1079	2709	9810	2968	18746
315 - 359	2150	484	335	273	267	375	2719	6284	12887
COLUMN TOTALS:	8253	5405	4539	12194	21372	9005	17701	12949	91418
BIASES:	1.02	1.00	.96	.98	1.00	.93	1.06	1.00	

PERCENT CORRECT: 47.51%
 HEIDKEF SKILL SCORE: .3790
 CHI-SQUARE: 121.70

PRECIPITATION AMOUNT (INCHES)

		VERIFYING OBSERVATION				ROW TOTALS
		.002 - .100	.001 - .0019	.000 - .0009		
GEM FORECAST	.002 - .100	0	0	0	0	0
	.001 - .0019	0	9	82	91	91
	.000 - .0009	17	121	91189	91327	91327
COLUMN TOTALS:		17	130	91271	91418	91418
BIASES:		0.00	.70	1.00		
PERCENT CORRECT: 99.76%						
HEIDKE SKILL SCORE: .0745						
CHI-SQUARE: 28.73						

PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
GEM FORECAST	YES	0	1	1
	NO	0	91417	91417
COLUMN TOTALS:		0	91418	91418
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
HEIDKE SKILL SCORE: 0.0000
CHI-SQUARE: 0.00
THREAT SCORE: 0.0000

FROZEN PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
GEM FORECAST	YES	0	0	0
	NO	0	91418	91418
COLUMN TOTALS:		0	91418	91418
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
HEIDKE SKILL SCORE: *****
CHI-SQUARE: 0.00
THREAT SCORE: *****

GFM VERSUS VERIFYING OBSERVATION AT 60 MINUTE INTERVALS

LOWEST CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
GFM							
FORECAST							
0 - 1	202	251	135	25	46	275	934
2 - 4	38	490	528	129	31	150	1366
5 - 9	13	109	289	237	44	269	961
10 - 29	53	139	426	2536	251	1130	4535
30 - 60	35	106	131	574	1686	1257	3789
61 - UNL	1156	2329	1524	2820	2274	67356	77459
COLUMN TOTALS:	1497	3424	3033	6321	4332	70437	89044
BIASES:	.62	.40	.32	.72	.88	1.10	

PERCENT CORRECT: 81.49
 HEIDKE SKILL SCORE: .3931
 CHI-SQUARE: 4136.93
 THREAT SCORE: .1572

SECOND CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
GFM							
FORECAST							
0 - 1	26	32	15	0	4	90	167
2 - 4	84	477	446	117	23	225	1372
5 - 9	1	132	374	215	50	181	953
10 - 29	2	77	323	2231	226	1264	4123
30 - 60	5	43	85	568	1326	1216	3243
61 - UNL	58	286	290	1435	1677	75440	79186
COLUMN TOTALS:	176	1047	1533	4566	3306	78416	89044
BIASES:	.95	1.31	.62	.90	.98	1.01	

PERCENT CORRECT: 89.70
 HEIDKE SKILL SCORE: .5160
 CHI-SQUARE: 372.52
 THREAT SCORE: .2888

THIRD CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	1	13	8	0	3	52	77
2 - 4	42	294	340	104	17	299	1096
5 - 9	0	201	429	221	35	230	1116
10 - 29	0	34	262	2021	223	1309	3849
30 - 60	1	28	60	405	987	1090	2571
61 - UNL	28	208	207	1250	1431	77211	80335
COLUMN TOTALS:	72	778	1306	4001	2696	80191	89044
BIASES:	1.07	1.41	.86	.96	.95	1.00	

PERCENT CORRECT: 90.90
 HEIDKE SKILL SCORE: .5066
 CHI-SQUARE: 169.80
 THREAT SCORE: .2092

FOURTH CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	1	2	3	0	0	31	37
2 - 4	6	222	303	82	6	351	970
5 - 9	0	145	395	196	29	321	1086
10 - 29	0	24	228	1487	216	1349	3304
30 - 60	0	16	36	401	753	1296	2502
61 - UNL	5	159	173	1004	1049	78755	81145
COLUMN TOTALS:	12	568	1138	3170	2053	82103	89044
BIASES:	3.08	1.71	.95	1.04	1.22	.99	

PERCENT CORRECT: 91.65
 HEIDKE SKILL SCORE: .4703
 CHI-SQUARE: 454.01
 THREAT SCORE: .1704

VISIBILITY (MILES)

VERIFYING OBSERVATION

	0 - 31/64	1/2 - 63/64	1 - 2 63/64	3 - 4 63/64	5 - 6 63/64	7 - 100	ROW TOTALS
GFM	87	27	79	74	63	149	479
FORECAST	42	11	130	66	29	88	366
	104	130	1705	1142	340	296	3717
	25	46	1014	2348	983	1130	5546
	27	24	265	1205	1672	2223	5416
	73	63	279	754	2401	69950	73520
COLUMN TOTALS:	358	301	3472	5589	5488	73836	89044
BIASES:	1.34	1.22	1.07	.99	.99	1.00	

PERCENT CORRECT: 85.10
 HEIDKE SKILL SCORE: .5130
 CHI-SQUARE: 74.85
 THREAT SCORE: .1249

STATION PRESSURE (INCHES OF Hg)

VERIFYING OBSERVATION

	0 - 29.235	29.236 - 29.530	29.531 - 29.677	29.678 - 29.825	29.826 - 29.973	29.974 - 30.120	30.121 - 30.268	30.269 - 30.563	30.564 - 35.000	ROW TOTALS
GFM	0	0	0	0	0	0	0	0	0	0
FORECAST	0	1572	79	0	0	0	0	0	0	1651
	0	74	2653	361	0	0	0	0	0	3088
	0	0	377	15361	1065	0	0	0	0	16803
	0	0	0	873	35641	1049	0	0	0	37563
	0	0	0	0	956	25060	283	0	0	26299
	0	0	0	0	0	334	3030	61	0	3425
	0	0	0	0	0	0	61	154	0	215
	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	0	1646	3109	16595	37662	26443	3374	215	0	89044
BIASES:	99.99	1.00	.99	1.01	1.00	1.00	1.02	1.00	99.99	

PERCENT CORRECT: 93.74
 HEIDKE SKILL SCORE: .9100
 CHI-SQUARE: 4.58

TEMPERATURE (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	-30 -	4	5 -	14	15 -	24	25 -	34	35 -	40 -	44	45 -	49	50 -	54	55 -	60 -	64	65 -	74	75 -	84	85 -	94	95 -	110	ROW TOTALS
-30 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 - 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 - 34	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
35 - 39	0	0	0	0	0	0	0	0	0	31	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
40 - 44	0	0	0	0	0	0	0	0	18	231	174	116	6	0	0	0	0	0	0	0	0	0	0	0	0	0	545
45 - 49	0	0	0	0	0	0	0	0	0	371	1618	512	205	11	0	0	0	0	0	0	0	0	0	0	0	0	2717
50 - 54	0	0	0	0	0	0	0	0	0	11	592	1641	889	327	7	0	0	0	0	0	0	0	0	0	0	0	3467
55 - 59	0	0	0	0	0	0	0	0	0	0	47	1165	4551	1555	295	0	0	0	0	0	0	0	0	0	0	0	7613
60 - 64	0	0	0	0	0	0	0	0	0	0	10	115	1664	8400	3666	0	0	0	0	0	0	0	0	0	0	0	13855
65 - 74	0	0	0	0	0	0	0	0	0	0	0	0	4	139	3331	21887	3817	0	0	0	0	0	0	0	0	0	29178
75 - 84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	3936	18539	1634	0	0	0	0	0	0	0	0	24139
85 - 94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	1743	5667	19	0	0	0	0	7457	
95 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	0	0	0	0	0	0	0	0	18	664	2463	3553	7454	13654	29819	24099	7301	19	0.00								89044
BIASES:	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	2.94	.82	1.10	.98	1.02	1.02	.98	1.00	1.02	1.00	.98	1.00	1.02	1.02	1.00	0.00			

PERCENT CORRECT: 70.23
 HEIDKE SKILL SCORE: .6166
 CHI-SQUARE: 160.19

DEW POINT DEPRESSION (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	0 - 1	2 - 7	8 - 15	16 - 25	26 - 99	ROW TOTALS
0 - 1	2917	3390	61	0	0	6368
2 - 7	5072	24788	4120	40	0	34020
8 - 15	29	3935	16295	3626	16	23901
16 - 25	0	189	3555	13805	1228	18777
26 - 99	0	0	70	1222	4686	5978
COLUMN TOTALS:	8018	32302	24101	18693	5930	89044
BIASES:	.79	1.05	.99	1.00	1.01	

PERCENT CORRECT: 70.18%
 HEIDKE SKILL SCORE: .5935
 CHI-SQUARE: 433.35

WIND SPEED (KT)

VERIFYING OBSERVATION

	0 - 1	2 - 9	10 - 19	20 - 29	30 - 99	ROW TOTALS
GEM	424	2466	1	0	0	2891
FORECAST	2469	67999	4730	6	0	75204
	4	4731	5911	141	0	10787
	0	0	150	12	0	162
	0	0	0	0	0	0
COLUMN TOTALS:	2897	75196	10792	159	0	89044
BIASES:	1.00	1.00	1.00	1.02	99.99	

PERCENT CORRECT: 83.49%
 HEIDKF. SKILL SCORE: .3910
 CHI-SQUARE: .07

WIND DIRECTION (DEG)

VERIFYING OBSERVATION

	00 - 44	45 - 89	90 - 134	135 - 179	180 - 224	225 - 269	270 - 314	315 - 359	ROW TOTALS
GEM	3278	1216	495	230	177	246	712	1883	8237
FORECAST	1027	1999	843	216	127	216	423	431	5282
	369	668	959	761	534	245	371	247	4154
	178	303	461	4753	4206	760	657	353	11671
	198	206	510	4013	12315	2109	1052	431	20834
	184	178	330	802	1958	2153	1950	353	7908
	649	282	460	828	1235	2626	9362	3014	18456
	2137	493	304	275	275	374	2689	5955	12502
COLUMN TOTALS:	8020	5345	4362	11878	20827	8729	17216	12667	89044
BIASES:	1.03	.99	.95	.98	1.00	.91	1.07	.99	

PERCENT CORRECT: 45.79%
 HEIDKF. SKILL SCORE: .3584
 CHI-SQUARE: 188.82

PRECIPITATION AMOUNT (INCHES)

		VERIFYING OBSERVATION				ROW TOTALS
		.002 - .100	.001 - .0019	.0019 - .0009	.000 - .0009	
GEM	.002 - .100	0	0	0	0	0
FORECAST	.001 - .0019	0	0	30	30	30
	.000 - .0009	17	129	88868	89014	89014
COLUMN TOTALS:		17	129	88898	89044	89044
BIASES:		0.00	.23	1.00		
PERCENT CORRECT:	99.80%					
HEIDKE SKILL SCORE:	-.0033					
CHI-SQUARE:	93.13					

PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
GEM	YES	0	3	3
FORECAST	NO	0	89041	89041
COLUMN TOTALS:		0	89044	89044
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: 0.0000
 CHI-SQUARE: 0.00
 THREAT SCORE: 0.0000

FROZEN PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
GEM	YES	0	0	0
FORECAST	NO	0	89044	89044
COLUMN TOTALS:		0	89044	89044
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

Persistence Results

PERSISTENCE VERSUS VERIFYING OBSERVATION AT 10 MINUTE INTERVALS

LOWEST CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	223	118	33	48	31	1234	1687
2 - 4	139	1121	338	158	97	2184	4037
PERSISTENCE 5 - 9	37	307	983	400	87	1485	3299
FORECAST 10 - 29	39	176	359	3969	339	2239	7121
30 - 60	42	103	70	359	2924	1660	5158
61 - UNL	1215	2199	1519	2139	1654	72284	81010
COLUMN TOTALS:	1695	4024	3302	7073	5132	81086	102312
BIASES:	1.00	1.00	1.00	1.01	1.01	1.00	

PERCENT CORRECT: 79.66
 HEIDKE SKILL SCORE: .4386
 CHI-SQUARE: .61
 THREAT SCORE: .1627

SECOND CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	75	47	0	0	0	90	212
2 - 4	67	846	236	38	13	140	1340
PERSISTENCE 5 - 9	3	204	838	263	47	274	1629
FORECAST 10 - 29	0	47	234	3525	238	1093	5137
30 - 60	4	30	35	261	2408	1173	3911
61 - UNL	65	157	272	1018	1188	87383	90083
COLUMN TOTALS:	214	1331	1615	5105	3894	90153	102312
BIASES:	.99	1.01	1.01	1.01	1.00	1.00	

PERCENT CORRECT: 92.93
 HEIDKE SKILL SCORE: .6782
 CHI-SQUARE: .53
 THREAT SCORE: .5019

THIRD CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	11	30	0	0	0	49	90
2 - 4	42	673	195	26	8	93	1037
5 - 9	1	182	782	211	21	209	1406
PERSISTENCE	0	29	186	3076	222	974	4487
FORECAST	2	18	28	213	1877	1024	3162
30 - 60	34	94	206	943	1017	89836	92130
61 - UNL							
COLUMN TOTALS:	90	1026	1397	4469	3145	92185	102312
BIASES:	1.00	1.01	1.01	1.00	1.01	1.00	

PERCENT CORRECT: 94.08

HEIDKE. SKILL. SCORE: .6808

CHI-SQUARE: .37

THREAT SCORE: .5084

FOURTH CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	0	4	0	0	0	12	16
2 - 4	10	468	160	16	3	105	762
5 - 9	0	168	706	147	8	243	1272
PERSISTENCE	0	13	138	2303	193	938	3585
FORECAST	0	10	18	163	1281	908	2380
30 - 60	6	95	237	930	885	92144	94297
61 - UNL							
COLUMN TOTALS:	16	758	1259	3559	2370	94350	102312
BIASES:	1.00	1.01	1.01	1.01	1.00	1.00	

PERCENT CORRECT: 94.71

HEIDKE. SKILL. SCORE: .6430

CHI-SQUARE: .42

THREAT SCORE: .4505

VISIBILITY (MILES)

VERIFYING OBSERVATION

	0 - 31/64	1/2 - 63/64	1 - 2 63/64	3 - 4 63/64	5 - 6 63/64	7 - 100	ROW TOTALS
0 - 31/64	345	89	109	65	35	40	683
1/2 - 63/64	94	127	167	75	21	39	523
PERSISTENCE 1 - 2 63/64	95	186	2963	1047	166	117	4574
FORECAST 3 - 4 63/64	63	67	981	4040	1147	449	6747
5 - 6 63/64	37	28	186	1142	3449	1738	6580
7 - 100	39	25	137	396	1788	80820	83205
COLUMN TOTALS:	673	522	4543	6765	6606	83203	102312
BIASES:	1.02	1.00	1.01	1.00	1.00	1.00	

PERCENT CORRECT: 89.67

HEIDKE. SKILL SCORE: .6852

CHI-SQUARE: .51

THREAT SCORE: .3751

STATION PRESSURE (INCHES OF Hg.)

VERIFYING OBSERVATION

	0 - 29.235	29.236 - 29.530	29.531 - 29.677	29.678 - 29.825	29.826 - 29.973	29.974 - 30.120	30.121 - 30.268	30.269 - 30.563	30.564 - 35.000	ROW TOTALS
0 - 29.235	0	0	0	0	0	0	0	0	0	0
29.236 - 29.530	0	1860	22	0	0	0	0	0	0	1882
29.531 - 29.677	0	22	3499	114	0	0	0	0	0	3635
PERSISTENCE 29.678 - 29.825	0	0	114	18558	412	0	0	0	0	19084
FORECAST 29.826 - 29.973	0	0	0	389	42318	280	0	0	0	42987
29.974 - 30.120	0	0	0	0	282	30240	57	0	0	30579
30.121 - 30.268	0	0	0	0	0	73	3846	11	0	3930
30.269 - 30.563	0	0	0	0	0	0	11	204	0	215
30.564 - 35.000	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	0	1882	3635	19061	43012	30593	3914	215	0	102312
BIASES:	99.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	99.99	

PERCENT CORRECT: 98.25

HEIDKE. SKILL SCORE: .9749

CHI-SQUARE: .11

TEMPERATURE (DEGREES FAHRENHEIT)

		VERIFYING OBSERVATION																ROW TOTALS
		-30 - 4	5 - 14	15 - 24	25 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	65 - 74	75 - 84	85 - 94	95 - 110			
PERSISTENCE FORECAST	-30 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	5 - 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	15 - 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	25 - 34	0	0	0	59	10	0	0	0	0	0	0	0	0	0	69		
	35 - 39	0	0	0	2	60	24	0	0	0	0	0	0	0	0	86		
	40 - 44	0	0	0	0	13	674	162	0	0	0	0	0	0	0	849		
	45 - 49	0	0	0	0	0	170	2684	312	0	0	0	0	0	0	3166		
	50 - 54	0	0	0	0	0	0	296	3799	574	0	0	0	0	0	4669		
	55 - 59	0	0	0	0	0	0	0	554	7663	773	0	0	0	0	8990		
	60 - 64	0	0	0	0	0	0	0	7	744	14230	1394	0	0	0	16375		
	65 - 74	0	0	0	0	0	0	0	0	3	1340	31245	1176	0	0	33764		
75 - 84	0	0	0	0	0	0	0	0	0	0	1181	24358	711	0	26250			
85 - 94	0	0	0	0	0	0	0	0	0	0	2	706	7352	15	8075			
95 - 110	0	0	0	0	0	0	0	0	0	0	0	0	15	4	19			
COLUMN TOTALS: BIASES:		0	0	0	61	83	868	3142	4672	8984	16343	33822	26240	8078	19	102312		

DEW POINT DEPRESSION (DEGREES FAHRENHEIT)

		VERIFYING OBSERVATION										
		0 - 1	2 - 7	8 - 15	16 - 25	26 - 99						ROW TOTALS
PERSISTENCE FORECAST	0 - 1	7211	2813	0	0	0						10024
	2 - 7	2825	34155	1687	0	0						38667
	8 - 15	0	1728	23654	1416	0						26798
	16 - 25	0	1	1416	18641	512						20570
	26 - 99	0	0	0	526	5727						6253
COLUMN TOTALS:		10036	38697	26757	20583	6239						102312
BIASFS:		1.00	1.00	1.00	1.00	1.00						

PERCENT CORRECT: 87.37%
HEIDKE SKILL SCORE: .8281
CHI-SQUARE: .14

WIND SPEED (KT)

VERIFYING OBSERVATION

	0 - 1	2 - 9	10 - 19	20 - 29	30 - 99	ROW TOTALS
PERSISTENCE	1013	2766	1	0	0	3780
FORECAST	2835	79953	3927	2	0	86717
	0	3933	7577	138	0	11648
	0	2	139	26	0	167
	0	0	0	0	0	0
COLUMN TOTALS:	3848	86654	11644	166	0	102312
BIASES:	.98	1.00	1.00	1.01	99.99	

PERCENT CORRECT: 86.57%
 HEIDKE SKILL SCORE: .4984
 CHI-SQUARE: 1.25

WIND DIRECTION (DEG)

VERIFYING OBSERVATION

	00 - 44	45 - 89	90 - 134	135 - 179	180 - 224	225 - 269	270 - 314	315 - 359	ROW TOTALS
PERSISTENCE	5407	1115	202	85	53	68	324	1894	9148
FORECAST	943	3426	847	123	50	81	190	309	5969
	187	816	2614	889	260	150	170	123	5209
	71	52	660	8458	3527	308	288	130	13494
	76	80	287	3176	17481	1876	616	200	23792
	88	74	229	377	1852	5465	2158	218	10461
	262	161	177	297	533	2172	13671	2673	19946
	2089	256	209	160	127	234	2512	8706	14293
COLUMN TOTALS:	9123	5980	5225	13565	23883	10354	19929	14253	102312
BIASES:	1.00	1.00	1.00	1.00	1.00	1.01	1.00	1.00	

PERCENT CORRECT: 63.75%
 HEIDKE SKILL SCORE: .5718
 CHI-SQUARE: 2.09

PRECIPITATION AMOUNT (INCHES)

VERIFYING OBSERVATION					ROW TOTALS
.002 - .100 .001 - .0019 .000 - .0009					
PERSISTENCE	.002 - .100	0	1	17	18
FORECAST	.001 - .0019	0	7	135	142
	.000 - .0009	17	138	101997	102152
COLUMN TOTALS:		17	146	102149	102312
BIASES:		1.06	.97	1.00	
PERCENT CORRECT:	99.70%				
HEIDKE SKILL SCORE:	.0451				
CHI-SQUARE:	.17				

PRECIPITATION OCCURRENCE (Y OR N)

VERIFYING OBSERVATION					ROW TOTALS
YES NO					
PERSISTENCE	YES	0	0	0	0
FORECAST	NO	0	102312	102312	102312
COLUMN TOTALS:		0	102312	102312	102312
BIASES:		99.99	1.00		

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: 1.0000
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

FROZEN PRECIPITATION OCCURRENCE (Y OR N)

VERIFYING OBSERVATION					ROW TOTALS
YES NO					
PERSISTENCE	YES	0	0	0	0
FORECAST	NO	0	102312	102312	102312
COLUMN TOTALS:		0	102312	102312	102312
BIASES:		99.99	1.00		

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: 1.0000
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

PERSISTENCE VERSUS VERIFYING OBSERVATION AT 20 MINUTE INTERVALS

LOWEST CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	211	124	32	48	28	1196	1639
2 - 4	149	1002	368	166	103	2142	3930
PERSISTENCE 5 - 9	44	287	895	412	92	1502	3232
FORECAST 10 - 29	51	166	394	3614	369	2359	6953
30 - 60	44	111	75	379	2583	1799	4991
61 - UNL	1148	2193	1476	2259	1773	69704	78553
COLUMN TOTALS:	1647	3883	3240	6878	4948	78702	99298
BIASES:	1.00	1.01	1.00	1.01	1.01	1.00	

PERCENT CORRECT: 78.56
 HEIDKE SKILL SCORE: .4090
 CHI-SQUARE: 2.10
 THREAT SCORE: .1546

SECOND CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	58	44	1	0	0	105	208
2 - 4	81	738	263	55	16	157	1310
PERSISTENCE 5 - 9	2	216	769	266	56	301	1610
FORECAST 10 - 29	1	45	233	3176	257	1314	5026
30 - 60	2	43	44	285	2101	1324	3799
61 - UNL	63	188	291	1171	1324	84308	87345
COLUMN TOTALS:	207	1274	1601	4953	3754	87509	99298
BIASES:	1.01	1.03	1.01	1.02	1.01	1.00	

PERCENT CORRECT: 91.79
 HEIDKE SKILL SCORE: .6277
 CHI-SQUARE: 3.00
 THREAT SCORE: .4432

THIRD CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	5	28	0	0	0	56	89
2 - 4	47	573	219	29	10	134	1012
5 - 9	2	189	715	224	25	239	1394
10 - 29	0	19	181	2776	230	1188	4394
30 - 60	2	35	34	243	1631	1129	3074
61 - UNL	29	132	235	1069	1147	86723	89335
COLUMN TOTALS:	85	976	1384	4341	3043	89469	99298
BIASES:	1.05	1.04	1.01	1.01	1.01	1.00	

PERCENT CORRECT: 93.08
 HEIDKE SKILL SCORE: .6282
 CHI-SQUARE: 2.75
 THREAT SCORE: .4327

FOURTH CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	0	1	0	0	0	15	16
2 - 4	10	405	169	18	3	137	742
5 - 9	0	171	651	153	12	271	1258
10 - 29	0	8	144	2064	202	1089	3507
30 - 60	0	19	17	199	1082	992	2309
61 - UNL	5	117	256	1021	994	89073	91466
COLUMN TOTALS:	15	721	1237	3455	2293	91577	99298
BIASES:	1.07	1.03	1.02	1.02	1.01	1.00	

PERCENT CORRECT: 93.93
 HEIDKE SKILL SCORE: .5916
 CHI-SQUARE: 2.06
 THREAT SCORE: .3859

VISIBILITY (MILES)

VERIFYING OBSERVATION

	0 - 31/64	1/2 - 63/64	1 - 2 63/64	3 - 4 63/64	5 - 6 63/64	7 - 100	ROW TOTALS
0 - 31/64	261	71	118	79	29	53	611
1/2 - 63/64	86	75	159	75	19	36	450
PERSISTENCE 1 - 2 63/64	86	168	2566	1126	208	160	4314
FORECAST 3 - 4 63/64	63	49	1022	3501	1167	642	6444
5 - 6 63/64	32	24	233	1205	2935	1922	6351
7 - 100	33	37	167	537	1994	78360	81128
COLUMN TOTALS:	561	424	4265	6523	6352	81173	99298
BIASES:	1.09	1.06	1.01	.99	1.00	1.00	

PERCENT CORRECT: 88.32
HEIDKE SKILL SCORE: .6370
CHI-SQUARE: 7.60
THREAT SCORE: .3175

STATION PRESSURE (INCHES OF Hg)

VERIFYING OBSERVATION

	0 - 29.235	29.236 - 29.530	29.531 - 29.677	29.678 - 29.825	29.826 - 29.973	29.974 - 30.120	30.121 - 30.268	30.269 - 30.563	30.564 - 35.000	ROW TOTALS
0 - 29.235	0	0	0	0	0	0	0	0	0	0
29.236 - 29.530	0	1792	38	0	0	0	0	0	0	1830
29.531 - 29.677	0	34	3316	165	0	0	0	0	0	3515
PERSISTENCE 29.678 - 29.825	0	0	175	17825	577	0	0	0	0	18577
FORECAST 29.826 - 29.973	0	0	0	539	40810	434	0	0	0	41783
29.974 - 30.120	0	0	0	0	427	29034	105	0	0	29566
30.121 - 30.268	0	0	0	0	0	131	3660	21	0	3812
30.269 - 30.563	0	0	0	0	0	0	21	194	0	215
30.564 - 35.000	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	0	1826	3529	18529	41814	29599	3786	215	0	99298
BIASES:	99.99	1.00	1.00	1.00	1.00	1.00	1.01	1.00	99.99	

PERCENT CORRECT: 97.31
HEIDKE SKILL SCORE: .9614
CHI-SQUARE: .43

TEMPERATURE (DEGREES FAHRENHEIT)

		VERIFYING OBSERVATION														ROW TOTALS	
		-30 - 4	5 - 14	15 - 24	25 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	65 - 74	75 - 84	85 - 94	95 - 110		
PERSISTENCE FORECAST	-30 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	5 - 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	15 - 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	25 - 34	0	0	0	41	18	0	0	0	0	0	0	0	0	0	59	
	35 - 39	0	0	0	0	31	36	0	0	0	0	0	0	0	0	67	
	40 - 44	0	0	0	0	12	576	194	0	0	0	0	0	0	0	782	
	45 - 49	0	0	0	0	0	217	2416	401	0	0	0	0	0	0	3034	
	50 - 54	0	0	0	0	0	0	363	3279	730	1	0	0	0	0	4373	
	55 - 59	0	0	0	0	0	0	4	677	6954	1000	0	0	0	0	8635	
	60 - 64	0	0	0	0	0	0	0	20	897	13083	1802	0	0	0	15802	
	65 - 74	0	0	0	0	0	0	0	0	15	1675	29379	1710	0	0	32779	
	75 - 84	0	0	0	0	0	0	0	0	0	1	1727	23253	850	0	25831	
	85 - 94	0	0	0	0	0	0	0	0	0	0	4	851	7044	18	7917	
	95 - 110	0	0	0	0	0	0	0	0	0	0	0	0	18	1	19	
	COLUMN TOTALS:		0	0	0	41	61	829	2977	4377	8596	15760	32912	25814	7912	19	99298
BIASES:		99.99	99.99	99.99	1.44	1.10	.94	1.02	1.00	1.01	1.00	1.00	1.00	1.00	1.00		

PERCENT CORRECT: 86.67
HEIDKE SKILL SCORE: .8292
CHI-SQUARE: 13.09

DEW POINT DEPRESSION (DEGREES FAHRENHEIT)

		VERIFYING OBSERVATION						ROW TOTALS
		0 - 1	2 - 7	8 - 15	16 - 25	26 - 99		
PERSISTENCE FORECAST	0 - 1	6903	2756	2	0	0	9661	
	2 - 7	2709	32172	2153	2	0	37036	
	8 - 15	0	2199	22225	1814	0	26238	
	16 - 25	0	13	1805	17707	650	20175	
	26 - 99	0	0	1	660	5527	6188	
COLUMN TOTALS:		9612	37140	26186	20183	6177	99298	
BIASPS:		1.01	1.00	1.00	1.00	1.00		

PERCENT CORRECT: 85.13%
HEIDK.F. SKILL SCORE: .7980
CHI-SQUARE: .67

WIND SPEED (KT)

VERIFYING OBSERVATION

0 - 1 2 - 9 10 - 19 20 - 29 30 - 99 ROW TOTALS

0 - 1 735 2806 4 0 0 3545
 2 - 9 2853 76929 4311 2 0 84095
 10 - 19 1 4322 7033 136 0 11492
 20 - 29 0 2 138 26 0 166
 30 - 99 0 0 0 0 0 0

PERSISTENCE
 FORECAST

COLUMN TOTALS:
 BIASES:

3589 84059 11486 164 0 99298
 .99 1.00 1.00 1.01 99.99

PERCENT CORRECT: 85.32%
 HEIDKE SKILL SCORE: .4531
 CHI-SQUARE: .58

WIND DIRECTION (DEG)

VERIFYING OBSERVATION

00 - 44 45 - 89 90 - 134 135 - 179 180 - 224 225 - 269 270 - 314 315 - 359 ROW TOTALS

00 - 44 4693 1197 305 136 98 137 459 1911 8938
 45 - 89 1019 2855 851 122 99 116 318 393 5773
 90 - 134 203 822 1962 889 405 222 281 211 4995
 PERSISTENCE 135 - 179 118 96 603 7211 4044 461 400 164 13097
 FORECAST 180 - 224 130 114 366 3550 15566 2104 916 309 23055
 225 - 269 122 125 336 517 2018 4412 2268 337 10135
 270 - 314 352 224 312 562 779 2263 11949 2912 19353
 315 - 359 2226 374 293 252 185 298 2664 7660 13952

COLUMN TOTALS:
 BIASES:

8863 5807 5028 13241 23194 10013 19255 13897 99298
 1.01 .99 .99 .99 1.01 1.01 1.01

PERCENT CORRECT: 56.71%
 HEIDKE SKILL SCORE: .4885
 CHI-SQUARE: 5.65

PRECIPITATION AMOUNT (INCHES)

		VERIFYING OBSERVATION				ROW TOTALS
		.002 - .100	.001 - .0019	.000 - .0009		
PERSISTENCE	.002 - .100	0	0	18	18	
FORECAST	.001 - .0019	0	3	138	141	
	.000 - .0009	17	140	98982	99139	
COLUMN TOTALS:		17	143	99138	99298	
BIASES:		1.06	.99	1.00		
PERCENT CORRECT:	99.68%					
HEIDKE SKILL SCORE:	.0174					
CHI-SQUARE:	.09					

PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
PERSISTENCE	YES	0	0	0
FORECAST	NO	0	99298	99298
COLUMN TOTALS:		0	99298	99298
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

FROZEN PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
PERSISTENCE	YES	0	0	0
FORECAST	NO	0	99298	99298
COLUMN TOTALS:		0	99298	99298
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

PERSISTENCE VERSUS VERIFYING OBSERVATION AT 30 MINUTE INTERVALS

LOWEST CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	204	107	44	48	33	1165	1601
2 - 4	145	905	381	189	105	2107	3832
PERSISTENCE 5 - 9	32	306	787	428	105	1520	3178
FORECAST 10 - 29	56	165	414	3320	378	2478	6811
30 - 60	36	121	101	381	2336	1842	4817
61 - UNL	1136	2149	1457	2337	1831	67343	76253
COLUMN TOTALS:	1609	3753	3184	6703	4788	76455	96492
BIASES:	1.00	1.02	1.00	1.02	1.01	1.00	

PERCENT CORRECT: 77.62
 HEIDKE SKILL SCORE: .3844
 CHI-SQUARE: 4.16
 THREAT SCORE: .1443

SECOND CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	64	26	6	0	1	106	203
2 - 4	81	651	274	78	14	181	1279
PERSISTENCE 5 - 9	0	220	672	287	73	347	1599
FORECAST 10 - 29	1	47	273	2936	269	1387	4913
30 - 60	1	40	62	272	1906	1392	3673
61 - UNL	57	236	290	1247	1377	81618	84825
COLUMN TOTALS:	204	1220	1577	4820	3640	85031	96492
BIASES:	1.00	1.05	1.01	1.02	1.01	1.00	

PERCENT CORRECT: 91.04
 HEIDKE SKILL SCORE: .5944
 CHI-SQUARE: 5.76
 THREAT SCORE: .3944

THIRD CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	5	13	4	0	0	66	88
2 - 4	49	498	224	50	6	161	988
5 - 9	0	196	632	248	46	259	1381
10 - 29	2	26	211	2546	234	1280	4299
30 - 60	0	30	46	238	1502	1154	2970
61 - UNL	28	168	243	1139	1168	84020	86766
COLUMN TOTALS:	84	931	1360	4221	2956	86940	96492
BIASES:	1.05	1.06	1.02	1.02	1.01	1.00	

PERCENT CORRECT: 92.45
 HEIDKE SKILL SCORE: .5952
 CHI-SQUARE: 5.86
 THREAT SCORE: .3702

FOURTH CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	0	1	0	0	0	15	16
2 - 4	11	340	158	30	2	183	724
5 - 9	0	164	585	179	17	299	1244
10 - 29	0	15	165	1872	193	1181	3426
30 - 60	0	16	27	186	989	1014	2232
61 - UNL	4	145	282	1093	1023	86303	88850
COLUMN TOTALS:	15	681	1217	3360	2224	88995	96492
BIASES:	1.07	1.06	1.02	1.02	1.00	1.00	

PERCENT CORRECT: 93.36
 HEIDKE SKILL SCORE: .5539
 CHI-SQUARE: 4.94
 THREAT SCORE: .3247

VISIBILITY (MILES)

VERIFYING OBSERVATION

	0 - 31/64	1/2 - 63/64	1 - 2 63/64	3 - 4 63/64	5 - 6 63/64	7 - 100	ROW TOTALS
0 - 31/64	205	50	126	75	28	72	556
1/2 - 63/64	72	36	152	75	30	40	405
PERSISTENCE 1 - 2 63/64	81	158	2267	1209	224	183	4122
FORECAST 3 - 4 63/64	30	38	1030	3112	1172	769	6151
5 - 6 63/64	41	30	229	1190	2577	2067	6134
7 - 100	61	54	208	608	2089	76104	79124
COLUMN TOTALS:	490	366	4012	6269	6120	79235	96492
BIASES:	1.14	1.11	1.03	.98	1.00	1.00	

PERCENT CORRECT: 87.37
 HEIDKE SKILL SCORE: .6010
 CHI-SQUARE: 18.47
 THREAT SCORE: .2497

STATION PRESSURE (INCHES OF Hg.)

VERIFYING OBSERVATION

	0 - 29.235	29.236 - 29.530	29.531 - 29.677	29.678 - 29.825	29.826 - 29.973	29.974 - 30.120	30.121 - 30.268	30.269 - 30.563	30.564 - 35.000	ROW TOTALS
0 - 29.235	0	0	0	0	0	0	0	0	0	0
29.236 - 29.530	0	1731	49	0	0	0	0	0	0	1780
29.531 - 29.677	0	44	3133	219	0	0	0	0	0	3396
PERSISTENCE 29.678 - 29.825	0	0	240	17151	724	0	0	0	0	18115
FORECAST 29.826 - 29.973	0	0	0	662	39410	581	0	0	0	40653
29.974 - 30.120	0	0	0	0	555	27918	155	0	0	28628
30.121 - 30.268	0	0	0	0	0	185	3489	31	0	3705
30.269 - 30.563	0	0	0	0	0	0	31	184	0	215
30.564 - 35.000	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	0	1775	3422	18032	40689	28684	3675	215	0	96492
BIASES:	99.99	1.00	.99	1.01	1.00	1.00	1.01	1.00	99.99	

PERCENT CORRECT: 96.40
 HEIDKE SKILL SCORE: .9482
 CHI-SQUARE: .98

VERIFYING OBSERVATION

PERSISTENCE FORECAST	-30 - 4	5 - 14	15 - 24	25 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	65 - 74	75 - 84	85 - 94	95 - 110	ROW TOTALS
-30 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 - 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 - 34	0	0	0	29	17	3	0	0	0	0	0	0	0	0	49
35 - 39	0	0	0	0	9	48	0	0	0	0	0	0	0	0	57
40 - 44	0	0	0	0	17	475	204	19	0	0	0	0	0	0	715
45 - 49	0	0	0	0	259	2208	2208	467	10	0	0	0	0	0	2944
50 - 54	0	0	0	0	0	4	420	2757	911	14	0	0	0	0	4106
55 - 59	0	0	0	0	0	0	2	847	6194	1279	11	0	0	0	8333
60 - 64	0	0	0	0	0	0	0	37	1114	11729	2389	0	0	0	15269
65 - 74	0	0	0	0	0	0	0	0	37	2183	27298	2285	0	0	31803
75 - 84	0	0	0	0	0	0	0	0	0	2	2331	22006	1091	0	25430
85 - 94	0	0	0	0	0	0	0	0	0	0	5	1110	6633	19	7767
95 - 110	0	0	0	0	0	0	0	0	0	0	0	0	19	0	19
COLUMN TOTALS:	0	0	0	29	43	789	2834	4127	8266	15207	32034	25401	7743	19	96492
BIASES:	99.99	99.99	99.99	1.69	1.33	.91	1.04	1.00	1.01	1.00	.99	1.00	1.00	1.00	

PERCENT CORRECT: 82.22
HEIDKE SKILL SCORE: .7720
CHI-SQUARE: 32.24

DEW POINT DEPRESSION (DEGREES FAHRENHEIT)

		VERIFYING OBSERVATION						ROW TOTALS
		0 - 1	2 - 7	8 - 15	16 - 25	26 - 99		
PERSISTENCE FORECAST	0 - 1	5910	3385	13	0	0	9308	
	2 - 7	3245	29659	2707	2	0	35613	
	8 - 15	2	2737	20588	2302	0	25629	
	16 - 25	0	25	2298	16666	823	19812	
	26 - 99	0	0	5	838	5287	6130	
COLUMN TOTALS:		9157	35806	25611	19808	6110	96492	
BIASES:		1.02	1.00	1.00	1.00	1.00		

PERCENT CORRECT: 80.95%
HEIDKE SKILL SCORE: .7416
CHI-SQUARE: 3.61

WIND SPEED (KT)

VERIFYING OBSERVATION

	0 - 1	2 - 9	10 - 19	20 - 29	30 - 99	ROW TOTALS
PERSISTENCE	591	2728	5	0	0	3324
FORECAST	2809	74443	4427	4	0	81683
	1	4422	6762	136	0	11321
	0	2	140	22	0	164
	0	0	0	0	0	0
COLUMN TOTALS:	3401	81595	11334	162	0	96492
BIASES:	.98	1.00	1.00	1.01	99.99	

PERCENT CORRECT: 84.79%
 HEIDKE SKILL SCORE: .4350
 CHI-SQUARE: 1.88

WIND DIRECTION (DEG)

VERIFYING OBSERVATION

	00 - 44	45 - 89	90 - 134	135 - 179	180 - 224	225 - 269	270 - 314	315 - 359	ROW TOTALS
PERSISTENCE	4157	1218	386	168	125	189	508	1982	8733
FORECAST	1053	2484	858	167	130	157	360	387	5596
	247	834	1580	865	489	234	317	243	4809
	113	141	575	6358	4231	557	490	218	12683
	140	130	395	3777	14328	2154	1062	395	22381
	210	136	325	612	2202	3710	2269	339	9803
	406	262	439	689	839	2347	10943	2931	18856
	2275	430	292	248	211	315	2770	7090	13631
COLUMN TOTALS:	8601	5635	4850	12884	22555	9663	18719	13585	96492
BIASES:	1.02	.99	.99	.98	.99	1.01	1.01	1.00	

PERCENT CORRECT: 52.49%
 HEIDKE SKILL SCORE: .4386
 CHI-SQUARE: 10.31

PRECIPITATION AMOUNT (INCHES)

		VERIFYING OBSERVATION				ROW TOTALS
		.002 - .100	.001 - .0019	.000 - .0009		
PERSISTENCE	.002 - .100	0	0	18		18
FORECAST	.001 - .0019	0	4	133		137
	.000 - .0009	17	135	96185		96337
COLUMN TOTALS:		17	139	96336		96492
BIASES:		1.06	.99	1.00		

PERCENT CORRECT: 99.69%
 HEIDKE SKILL SCORE: .0244
 CHI-SQUARE: .09

PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
PERSISTENCE	YES	0	0	0
FORECAST	NO	0	96492	96492
COLUMN TOTALS:		0	96492	96492
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

FROZEN PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
PERSISTENCE	YES	0	0	0
FORECAST	NO	0	96492	96492
COLUMN TOTALS:		0	96492	96492
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

PERSISTENCE VERSUS VERIFYING OBSERVATION AT 40 MINUTE INTERVALS

LOWEST CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	176	104	46	52	36	1151	1565
2 - 4	156	782	424	191	120	2068	3741
PERSISTENCE 5 - 9	33	324	734	464	95	1480	3130
FORECAST 10 - 29	59	173	424	3085	378	2523	6642
30 - 60	35	112	94	412	2141	1854	4648
61 - UNL	1104	2142	1402	2355	1883	65275	74161
COLUMN TOTALS:	1563	3637	3124	6559	4653	74351	93887
BIASES:	1.00	1.03	1.00	1.01	1.00	1.00	

PERCENT CORRECT: 76.89
 HEIDKE SKILL SCORE: .3654
 CHI-SQUARE: 4.53
 THREAT SCORE: .1311

SECOND CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	52	34	9	0	2	100	197
2 - 4	84	541	319	67	23	210	1244
PERSISTENCE 5 - 9	0	244	616	316	65	345	1586
FORECAST 10 - 29	4	60	278	2713	263	1472	4790
30 - 60	1	39	46	326	1752	1383	3547
61 - UNL	54	241	288	1289	1436	79215	82523
COLUMN TOTALS:	195	1159	1556	4711	3541	82725	93887
BIASES:	1.01	1.07	1.02	1.02	1.00	1.00	

PERCENT CORRECT: 90.42
 HEIDKE SKILL SCORE: .5665
 CHI-SQUARE: 8.66
 THREAT SCORE: .3412

THIRD CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	6	14	3	0	0	62	85
2 - 4	44	399	255	48	9	203	958
5 - 9	0	215	567	282	41	266	1371
10 - 29	2	38	220	2368	219	1347	4194
30 - 60	0	32	39	255	1379	1157	2862
61 - UNL	28	179	251	1178	1227	81554	84417
COLUMN TOTALS:	80	877	1335	4131	2875	84589	93887
BIASES:	1.06	1.09	1.03	1.02	1.00	1.00	

PERCENT CORRECT: 91.89
 HEIDKE SKILL SCORE: .5656
 CHI-SQUARE: 10.13
 THREAT SCORE: .3012

FOURTH CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	0	1	0	0	0	15	16
2 - 4	8	267	181	33	2	214	705
5 - 9	0	175	527	203	24	303	1232
10 - 29	0	20	181	1758	171	1205	3335
30 - 60	0	22	19	188	931	993	2153
61 - UNL	5	159	271	1101	1031	83679	86446
COLUMN TOTALS:	13	644	1179	3283	2159	86609	93887
BIASES:	1.23	1.10	1.05	1.02	1.00	1.00	

PERCENT CORRECT: 93.05
 HEIDKE SKILL SCORE: .5325
 CHI-SQUARE: 10.00
 THREAT SCORE: .2505

VISIBILITY (MILES)

VERIFYING OBSERVATION

	0 - 31/64	1/2 - 63/64	1 - 2 63/64	3 - 4 63/64	5 - 6 63/64	7 - 100	ROW TOTALS
0 - 31/64	162	33	106	82	36	92	511
1/2 - 63/64	56	22	160	60	31	56	385
PERSISTENCE 1 - 2 63/64	93	153	2009	1224	279	207	3965
FORECAST 3 - 4 63/64	29	46	1055	2793	1119	891	5933
5 - 6 63/64	25	22	238	1226	2227	2141	5879
7 - 100	76	53	230	652	2218	73985	77214
COLUMN TOTALS:	441	329	3798	6037	5910	77372	93887
BIASES:	1.16	1.17	1.04	.98	1.00	1.00	

PERCENT CORRECT: 86.48
 HEIDKE SKILL SCORE: .5675
 CHI-SQUARE: 30.26
 THREAT SCORE: .1960

STATION PRESSURE (INCHES OF Hg)

VERIFYING OBSERVATION

	0 - 29.235	29.236 - 29.530	29.531 - 29.677	29.678 - 29.825	29.826 - 29.973	29.974 - 30.120	30.121 - 30.268	30.269 - 30.563	30.564 - 35.000	ROW TOTALS
0 - 29.235	0	0	0	0	0	0	0	0	0	0
29.236 - 29.530	0	1672	59	0	0	0	0	0	0	1731
PERSISTENCE 29.531 - 29.677	0	54	2966	265	0	0	0	0	0	3285
FORECAST 29.678 - 29.825	0	0	287	16515	858	0	0	0	0	17660
29.826 - 29.973	0	0	0	758	38086	744	0	0	0	39588
29.974 - 30.120	0	0	0	0	698	26902	203	0	0	27803
30.121 - 30.268	0	0	0	0	0	236	3328	41	0	3605
30.269 - 30.563	0	0	0	0	0	0	41	174	0	215
30.564 - 35.000	0	0	0	0	0	0	0	- 0	0	0
COLUMN TOTALS:	0	1726	3312	17538	39642	27882	3572	215	0	93887
BIASES:	99.99	1.00	.99	1.01	1.00	1.00	1.01	1.00	99.99	

PERCENT CORRECT: 95.48
 HEIDKE SKILL SCORE: .9350
 CHI-SQUARE: 1.69

TEMPERATURE (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	-30 -	4	5 -	14	15 -	24	25 -	34	35 -	39	40 -	44	45 -	49	50 -	54	55 -	59	60 -	64	65 -	74	75 -	84	85 -	94	95 -	110	ROW TOTALS
PERSISTENCE	-30 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FORECAST	5 - 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	15 - 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	25 - 34	0	0	0	0	0	19	7	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
	35 - 39	0	0	0	0	0	1	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
	40 - 44	0	0	0	0	0	20	367	207	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	647
	45 - 49	0	0	0	0	0	0	310	1988	519	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2872
	50 - 54	0	0	0	0	0	0	5	495	2246	1030	87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3863
	55 - 59	0	0	0	0	0	0	0	15	1010	5503	1507	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8088
	60 - 64	0	0	0	0	0	0	0	2	67	1350	10408	2935	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14762
	65 - 74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	2670	25297	2855	0	0	0	0	0	0	0	0	30877
	75 - 84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	2950	20754	1309	0	0	0	0	0	0	0	25021
	85 - 94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	1358	6258	18	0	0	0	0	0	7646
	95 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	1	0	0	0	19
COLUMN TOTALS:		0	0	0	0	0	19	28	747	2707	3895	7993	14680	31247	24967	7585	19	93887											
BIASES:		99.99	99.99	99.99	99.99	2.05	1.89	.87	1.06	.99	1.01	1.01	1.01	.99	1.00	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

PERCENT CORRECT: 77.58
 HEIDKE SKILL SCORE: .7121
 CHI-SQUARE: 73.66

DEW POINT DEPRESSION (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	0 - 1	2 - 7	8 - 15	16 - 25	26 - 99	ROW TOTALS
PERSISTENCE	0 - 1	4809	4137	40	0	8986
FORECAST	2 - 7	3935	27140	3256	4	34335
	8 - 15	2	3229	19017	2762	25011
	16 - 25	0	64	2748	15676	19474
	26 - 99	0	0	20	999	6081
COLUMN TOTALS:		8746	34570	25081	19441	93887
BIASES:		1.03	.99	1.00	1.00	1.01

PERCENT CORRECT: 76.37%
 HEIDKE SKILL SCORE: .6799
 CHI-SQUARE: 8.60

WIND SPEED (KT)

VERIFYING OBSERVATION

	0 - 1	2 - 9	10 - 19	20 - 29	30 - 99	ROW TOTALS
0 - 1	547	2609	0	0	0	3156
2 - 9	2651	72257	4504	3	0	79415
10 - 19	3	4486	6523	140	0	11152
20 - 29	0	2	144	18	0	164
30 - 99	0	0	0	0	0	0
COLUMN TOTALS:	3201	79354	11171	161	0	93887
BIASES:	.99	1.00	1.00	1.02	99.99	

PERCENT CORRECT: 84.51%
 HEIDKE SKILL SCORE: .4259
 CHI-SQUARE: .77

WIND DIRECTION (DEG)

VERIFYING OBSERVATION

	00 - 44	45 - 89	90 - 134	135 - 179	180 - 224	225 - 269	270 - 314	315 - 359	ROW TOTALS
00 - 44	3817	1215	446	203	143	227	553	1931	8535
45 - 89	1021	2256	870	143	160	179	389	474	5492
90 - 134	268	865	1301	872	531	213	391	215	4656
PERSISTENCE	135 - 179	130	555	5676	4274	656	577	245	12241
FORECAST	180 - 224	181	393	3825	13460	2167	1095	433	21717
	225 - 269	163	331	790	2231	3088	2319	369	9516
	270 - 314	254	491	738	890	2437	10111	3001	18390
	315 - 359	450	315	268	242	351	2795	6598	13340
COLUMN TOTALS:	8411	5514	4702	12515	21931	9318	18230	13266	93887
BIASES:	1.02	1.00	.99	.98	.99	1.02	1.01	1.01	

PERCENT CORRECT: 49.32%
 HEIDKE SKILL SCORE: .4012
 CHI-SQUARE: 16.48

PRECIPITATION AMOUNT (INCHES)

		VERIFYING OBSERVATION				ROW TOTALS
		.002 - .100	.001 - .0019	.000 - .0009		
PERSISTENCE	.002 - .100	0	0	18	18	
FORECAST	.001 - .0019	0	4	125	129	
	.000 - .0009	17	130	93593	93740	
COLUMN TOTALS:		17	134	93736	93887	
BIASES:		1.06	.96	1.00		
PERCENT CORRECT:	99.69%					
HEIDKE SKILL SCORE:	.0255					
CHI-SQUARE:	.25					

PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
PERSISTENCE	YES	0	0	0
FORECAST	NO	0	93887	93887
COLUMN TOTALS:		0	93887	93887
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

FROZEN PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
PERSISTENCE	YES	0	0	0
FORECAST	NO	0	93887	93887
COLUMN TOTALS:		0	93887	93887
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

PERSISTENCE VERSUS VERIFYING OBSERVATION AT 50 MINUTE INTERVALS

LOWEST CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	150	114	51	48	40	1120	1523
2 - 4	159	684	458	194	113	2041	3649
5 - 9	44	325	675	490	94	1446	3074
10 - 29	55	186	429	2898	370	2533	6471
30 - 60	41	109	96	466	1969	1816	4497
61 - UNL	1081	2108	1368	2358	1921	63368	72204
COLUMN TOTALS:	1530	3526	3077	6454	4507	72324	91418
BIASES:	1.00	1.04	1.00	1.00	1.00	1.00	

PERCENT CORRECT: 76.29
 HEIDKE SKILL SCORE: .3500
 CHI-SQUARE: 4.59
 THREAT SCORE: .1214

SECOND CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	31	35	10	0	3	106	185
2 - 4	90	454	337	74	28	235	1218
5 - 9	2	257	568	327	65	352	1571
10 - 29	3	64	292	2553	257	1497	4666
30 - 60	3	35	57	365	1609	1366	3435
61 - UNL	57	253	280	1329	1468	76956	80343
COLUMN TOTALS:	186	1098	1544	4648	3430	80512	91418
BIASES:	1.00	1.11	1.02	1.00	1.00	1.00	

PERCENT CORRECT: 89.88
 HEIDKE SKILL SCORE: .5434
 CHI-SQUARE: 14.02
 THREAT SCORE: .2937

THIRD CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	5	15	6	0	2	52	80
2 - 4	39	326	264	54	12	242	937
PERSISTENCE 5 - 9	1	220	536	277	43	282	1359
FORECAST 10 - 29	0	38	237	2245	227	1344	4091
30 - 60	2	27	51	299	1261	1135	2775
61 - UNL	27	194	227	1198	1242	79288	82176
COLUMN TOTALS:	74	820	1321	4073	2787	82343	91418
BIASES:	1.08	1.14	1.03	1.00	1.00	1.00	

PERCENT CORRECT: 91.51
 HEIDKE SKILL SCORE: .5465
 CHI-SQUARE: 18.74
 THREAT SCORE: .2523

FOURTH CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	1	1	1	0	1	12	16
2 - 4	7	200	189	33	2	256	687
PERSISTENCE 5 - 9	0	187	497	203	20	316	1223
FORECAST 10 - 29	0	19	189	1636	192	1217	3253
30 - 60	1	19	29	212	820	999	2080
61 - UNL	3	174	253	1148	1068	81513	84159
COLUMN TOTALS:	12	600	1158	3232	2103	84313	91418
BIASES:	1.33	1.15	1.06	1.01	.99	1.00	

PERCENT CORRECT: 92.62
 HEIDKE SKILL SCORE: .5042
 CHI-SQUARE: 18.27
 THREAT SCORE: .1890

VISIBILITY (MILES)

VERIFYING OBSERVATION

	0 - 31/64	1/2 - 63/64	1 - 2 63/64	3 - 4 63/64	5 - 6 63/64	7 - 100	ROW TOTALS
0 - 31/64	114	32	101	88	25	134	494
1/2 - 63/64	54	10	133	72	40	68	377
PERSISTENCE 1 - 2 63/64	101	151	1834	1187	298	269	3840
FORECAST 3 - 4 63/64	35	44	1071	2491	1053	1027	5721
5 - 6 63/64	23	29	228	1221	1935	2204	5640
7 - 100	68	44	251	730	2366	71887	75346
COLUMN TOTALS:	395	310	3618	5789	5717	75589	91418
BIASES:	1.25	1.22	1.06	.99	.99	1.00	

PERCENT CORRECT: 85.62
 HEIDKE SKILL SCORE: .5346
 CHI-SQUARE: 55.53
 THREAT SCORE: .1537

STATION PRESSURE (INCHES OF Hg)

VERIFYING OBSERVATION

	0 - 29.235	29.236 - 29.530	29.531 - 29.677	29.678 - 29.825	29.826 - 29.973	29.974 - 30.120	30.121 - 30.268	30.269 - 30.563	30.564 - 35.000	ROW TOTALS
0 - 29.235	0	0	0	0	0	0	0	0	0	0
29.236 - 29.530	0	1622	69	0	0	0	0	0	0	1691
29.531 - 29.677	0	64	2814	310	0	0	0	0	0	3188
PERSISTENCE 29.678 - 29.825	0	0	327	15925	961	0	0	0	0	17213
FORECAST 29.826 - 29.973	0	0	0	817	36862	889	0	0	0	38568
29.974 - 30.120	0	0	0	0	823	25972	243	0	0	27038
30.121 - 30.268	0	0	0	0	0	286	3168	51	0	3505
30.269 - 30.563	0	0	0	0	0	0	51	164	0	215
30.564 - 35.000	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	0	1686	3210	17052	38646	27147	3462	215	0	91418
BIASES:	99.99	1.00	.99	1.01	1.00	1.00	1.01	1.00	99.99	

PERCENT CORRECT: 94.65
 HEIDKE SKILL SCORE: .9231
 CHI-SQUARE: 2.81

TEMPERATURE (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	-30 -	5 -	15 -	25 -	35 -	40 -	45 -	50 -	55 -	60 -	65 -	75 -	85 -	95 -	ROW TOTALS
	4	14	24	34	39	44	49	54	59	64	74	84	94	110	
-30 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 - 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 - 34	0	0	0	9	0	20	0	0	0	0	0	0	0	0	29
35 - 39	0	0	0	0	0	45	8	0	0	0	0	0	0	0	53
40 - 44	0	0	0	0	19	288	194	85	0	0	0	0	0	0	586
45 - 49	0	0	0	0	0	349	1769	548	131	1	0	0	0	0	2798
50 - 54	0	0	0	0	0	5	573	1876	982	207	0	0	0	0	3643
55 - 59	0	0	0	0	0	0	30	1117	5002	1567	150	0	0	0	7866
60 - 64	0	0	0	0	0	0	6	92	1512	9302	3388	0	0	0	14300
65 - 74	0	0	0	0	0	0	0	0	94	3064	23479	3355	0	0	29992
75 - 84	0	0	0	0	0	0	0	0	0	15	3471	19604	1505	0	24595
85 - 94	0	0	0	0	0	0	0	0	0	0	19	1576	5923	19	7537
95 - 110	0	0	0	0	0	0	0	0	0	0	0	0	19	0	19
COLUMN TOTALS:	0	0	0	9	19	707	2580	3718	7721	14156	30507	24535	7447	19	91418
BIASES:	99.99	99.99	99.99	3.22	2.79	.83	1.08	.98	1.02	1.01	.98	1.00	1.01	1.00	

PERCENT CORRECT: 73.57
 HEIDKE SKILL SCORE: .6600
 CHI-SQUARE: 160.04

DEW POINT DEPRESSION (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	0 - 1	2 - 7	8 - 15	16 - 25	26 - 99	ROW TOTALS
PERSISTENCE	3936	4661	94	0	0	8691
FORECAST	4437	25006	3663	16	0	33122
	18	3590	17600	3228	6	24442
	0	132	3193	14678	1130	19133
	0	0	40	1136	4854	6030
COLUMN TOTALS:	8391	33389	24590	19058	5990	91418
BIASES:	1.04	.99	.99	1.00	1.01	

PERCENT CORRECT: 72.28%
 HEIDKE SKILL SCORE: .6249
 CHI-SQUARE: 14.31

WIND SPEED (KT)

VERIFYING OBSERVATION

	0 - 1	2 - 9	10 - 19	20 - 29	30 - 99	ROW TOTALS
PERSISTENCE	498	2521	5	0	0	3024
FORECAST	2536	70099	4642	4	0	77281
	5	4624	6184	138	0	10951
	0	1	142	19	0	162
	0	0	0	0	0	0
COLUMN TOTALS:	3039	77245	10973	161	0	91418
BIASES:	1.00	1.00	1.00	1.01	99.99	

PERCENT CORRECT: 84.01%
 HEIDKE SKILL SCORE: .4083
 CHI-SQUARE: .14

WIND DIRECTION (DEG)

VERIFYING OBSERVATION

	00 - 44	45 - 89	90 - 134	135 - 179	180 - 224	225 - 269	270 - 314	315 - 359	ROW TOTALS
PERSISTENCE	3605	1159	484	206	161	217	627	1928	8387
FORECAST	989	2164	867	188	141	238	411	409	5407
	336	797	1152	794	570	219	394	253	4515
	132	141	462	5243	4309	697	582	268	11834
	200	206	445	3849	12732	2115	1108	404	21059
	195	185	298	865	2210	2822	2309	380	9264
	617	267	496	776	974	2322	9551	2970	17973
	2179	486	335	273	275	375	2719	6337	12979
COLUMN TOTALS:	8253	5405	4539	12194	21372	9005	17701	12949	91418
BIASES:	1.02	1.00	1.00	.97	.99	1.03	1.02	1.00	

PERCENT CORRECT: 47.70%
 HEIDKE SKILL SCORE: .3821
 CHI-SQUARE: 29.21

PRECIPITATION AMOUNT (INCHES)

		VERIFYING OBSERVATION				ROW TOTALS
		.002 - .100	.001 - .0019	.000 - .0009		
PERSISTENCE	.002 - .100	0	0	18	18	
FORECAST	.001 - .0019	0	13	113	126	
	.000 - .0009	17	117	91140	91274	
COLUMN TOTALS:		17	130	91271	91418	
BIASES:		1.06	.97	1.00		
PERCENT CORRECT:	99.71%					
HEIDKE SKILL SCORE:	.0861					
CHI-SQUARE:	.18					

PRECIPITATION OCCURRENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
PERSISTENCE	YES	0	0	0
FORECAST	NO	0	91418	91418
COLUMN TOTALS:		0	91418	91418
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

FROZEN PRECIPITATION OCCURRENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
PERSISTENCE	YES	0	0	0
FORECAST	NO	0	91418	91418
COLUMN TOTALS:		0	91418	91418
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

PERSISTENCE VERSUS VERIFYING OBSERVATION AT 60 MINUTE INTERVALS

LOWEST CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	142	111	54	44	39	1096	1486
2 - 4	158	591	509	188	135	1995	3576
PERSISTENCE 5 - 9	39	355	597	482	97	1447	3017
FORECAST 10 - 29	60	196	425	2762	363	2508	6314
30 - 60	42	129	109	491	1821	1767	4359
61 - UNL	1056	2042	1339	2354	1877	61624	70292
COLUMN TOTALS:	1497	3424	3033	6321	4332	70437	89044
BIASES:	.99	1.04	1.00	1.00	1.01	1.00	

PERCENT CORRECT: 75.85
 HEIDKE SKILL SCORE: .3386
 CHI-SQUARE: 7.39
 THREAT SCORE: .1116

SECOND CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	26	33	15	0	5	100	179
2 - 4	82	374	370	91	23	256	1196
PERSISTENCE 5 - 9	3	265	513	346	68	357	1552
FORECAST 10 - 29	2	64	290	2372	263	1560	4551
30 - 60	4	40	69	403	1477	1344	3337
61 - UNL	59	271	276	1354	1470	74799	78229
COLUMN TOTALS:	176	1047	1533	4566	3306	78416	89044
BIASES:	1.02	1.14	1.01	1.00	1.01	1.00	

PERCENT CORRECT: 89.35
 HEIDKE SKILL SCORE: .5199
 CHI-SQUARE: 22.28
 THREAT SCORE: .2472

THIRD CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	1	13	8	0	3	52	77
2 - 4	36	254	280	69	15	262	916
5 - 9	3	235	491	294	42	282	1347
10 - 29	0	35	256	2056	234	1417	3998
30 - 60	1	26	56	332	1149	1138	2702
61 - UNL	31	215	215	1250	1253	77040	80004
COLUMN TOTALS:	72	778	1306	4001	2696	80191	89044
BIASES:	1.07	1.18	1.03	1.00	1.00	1.00	

PERCENT CORRECT: 90.96
 HEIDKE SKILL SCORE: .5179
 CHI-SQUARE: 26.56
 THREAT SCORE: .1975

FOURTH CLOUD HIT (00')

VERIFYING OBSERVATION

	0 - 1	2 - 4	5 - 9	10 - 29	30 - 60	61 - UNL	ROW TOTALS
0 - 1	1	1	1	0	0	12	15
2 - 4	6	159	185	40	3	277	670
5 - 9	0	191	464	223	23	316	1217
10 - 29	0	22	215	1470	207	1258	3172
30 - 60	0	15	36	254	737	973	2015
61 - UNL	5	180	237	1183	1083	79267	81955
COLUMN TOTALS:	12	568	1138	3170	2053	82103	89044
BIASES:	1.25	1.18	1.07	1.00	.98	1.00	

PERCENT CORRECT: 92.20
 HEIDKE SKILL SCORE: .4777
 CHI-SQUARE: 25.52
 THREAT SCORE: .1521

VISIBILITY (MILES)

VERIFYING OBSERVATION

	0 - 31/64	1/2 - 63/64	1 - 2 63/64	3 - 4 63/64	5 - 6 63/64	7 - 100	ROW TOTALS
0 - 31/64	85	27	79	73	63	149	476
1/2 - 63/64	44	11	130	67	29	88	369
PERSISTENCE	104	130	1705	1150	343	299	3731
FORECAST	25	46	1014	2338	979	1120	5522
	27	24	265	1207	1673	2230	5426
	73	63	279	754	2401	69950	73520
COLUMN TOTALS:	358	301	3472	5589	5488	73836	89044
BIASES:	1.33	1.23	1.08	.99	.99	1.00	

PERCENT CORRECT: 85.08
 HEIDKE SKILL SCORE: .5126
 CHI-SQUARE: 76.43
 THREAT SCORE: .1249

STATION PRESSURE (INCHES OF Hg)

VERIFYING OBSERVATION

	0 - 29.235	29.236 - 29.530	29.531 - 29.677	29.678 - 29.825	29.826 - 29.973	29.974 - 30.120	30.121 - 30.268	30.269 - 30.563	30.564 - 35.000	ROW TOTALS
0 - 29.235	0	0	0	0	0	0	0	0	0	0
29.236 - 29.530	0	1572	79	0	0	0	0	0	0	1651
29.531 - 29.677	0	74	2653	361	0	0	0	0	0	3088
PERSISTENCE	0	0	377	15361	1065	0	0	0	0	16803
FORECAST	0	0	0	873	35641	1049	0	0	0	37563
	0	0	0	0	956	25060	283	0	0	26299
	0	0	0	0	0	334	3030	61	0	3425
	0	0	0	0	0	0	61	154	0	215
	0	0	0	0	0	0	0	0	0	0
COLUMN TOTALS:	99.99	1646	3109	16595	37662	26443	3374	215	99.99	89044
BIASES:		1.00	.99	1.01	1.00	1.00	1.02	1.00		

PERCENT CORRECT: 93.74
 HEIDKE SKILL SCORE: .9100
 CHI-SQUARE: 4.58

TEMPERATURE (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	-30 -	4	5 -	14	15 -	24	25 -	34	35 -	39	40 -	44	45 -	49	50 -	54	55 -	59	60 -	64	65 -	74	75 -	84	85 -	94	95 -	110	ROW TOTALS
-30 - 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 - 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 - 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 - 34	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
35 - 39	0	0	0	0	0	0	0	0	0	0	31	0	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
40 - 44	0	0	0	0	0	0	0	0	18	0	231	174	116	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	545
45 - 49	0	0	0	0	0	0	0	0	0	0	371	1618	512	205	11	0	0	0	0	0	0	0	0	0	0	0	0	0	2717
50 - 54	0	0	0	0	0	0	0	0	0	0	11	592	1641	889	327	7	0	0	0	0	0	0	0	0	0	0	0	0	3467
55 - 59	0	0	0	0	0	0	0	0	0	0	0	47	1165	4551	1555	295	0	0	0	0	0	0	0	0	0	0	0	0	7613
60 - 64	0	0	0	0	0	0	0	0	0	0	0	10	115	1664	8400	3666	0	0	0	0	0	0	0	0	0	0	0	0	13855
65 - 74	0	0	0	0	0	0	0	0	0	0	0	0	0	4	139	3331	21887	3817	0	0	0	0	0	0	0	0	0	0	29178
75 - 84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	3936	18539	1634	0	0	0	0	0	0	24139
85 - 94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	1743	5648	19	0	0	0	0	0	7438
95 - 110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
COLUMN TOTALS:	0	0	0	0	0	0	0	0	18	664	2463	3553	7454	13654	29819	24099	7301	19	1.00	1.02	1.00	1.02	1.00	1.02	1.00	1.02	1.00	1.00	89044
BIASES:	99.99	99.99	99.99	99.99	99.99	99.99	99.99	2.94	.82	1.10	.98	1.02	1.02	1.02	.98	1.00	1.02	1.00	1.02	1.00	1.02	1.00	1.02	1.00	1.02	1.00	1.02	1.00	1.00

PERCENT CORRECT: 70.21
 HEIDKE SKILL SCORE: .6164
 CHI-SQUARE: 140.42

DEW POINT DEPRESSION (DEGREES FAHRENHEIT)

VERIFYING OBSERVATION

	0 - 1	2 - 7	8 - 15	16 - 25	26 - 99	ROW TOTALS
0 - 1	3282	4961	187	0	0	8430
2 - 7	4707	23217	3994	40	0	31958
8 - 15	29	3935	16295	3626	16	23901
16 - 25	0	189	3555	13805	1228	18777
26 - 99	0	0	70	1222	4686	5978
COLUMN TOTALS:	8018	32302	24101	18693	5930	89044
BIASES:	1.05	.99	.99	1.00	1.01	

PERCENT CORRECT: 68.83%
 HEIDKE SKILL SCORE: .5787
 CHI-SQUARE: 27.26

WIND SPEED (KT)

VERIFYING OBSERVATION

	0 - 1	2 - 9	10 - 19	20 - 29	30 - 99	ROW TOTALS
PERSISTENCE	424	2463	1	0	0	2888
FORECAST	2469	67998	4730	6	0	75203
	4	4735	5911	141	0	10791
	0	0	150	12	0	162
	0	0	0	0	0	0
COLUMN TOTALS:	2897	75196	10792	159	0	89044
BIASES:	1.00	1.00	1.00	1.02	99.99	

PERCENT CORRECT: 83.49%
 HEIDKE SKILL SCORE: .3910
 CHI-SQUARE: .09

WIND DIRECTION (DEG)

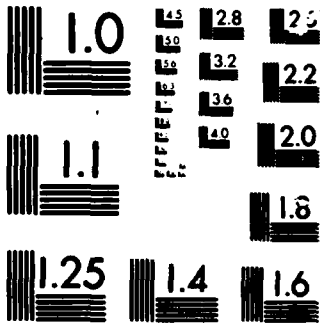
VERIFYING OBSERVATION

	00 - 44	45 - 89	90 - 134	135 - 179	180 - 224	225 - 269	270 - 314	315 - 359	ROW TOTALS
PERSISTENCE	3278	1216	495	230	175	246	712	1883	8235
FORECAST	1039	2004	856	216	127	216	423	431	5312
	372	765	990	811	571	249	395	260	4413
	127	195	369	4808	4323	749	624	257	11452
	190	204	538	3875	12066	2082	1051	430	20436
	190	190	348	848	2210	2581	2252	361	8980
	646	275	459	811	1076	2232	9066	3018	17583
	2178	496	307	279	279	374	2693	6027	12633
COLUMN TOTALS:	8020	5345	4362	11878	20827	8729	17216	12667	89044
BIASES:	1.03	.99	1.01	.96	.98	1.03	1.02	1.00	

PERCENT CORRECT: 45.84%
 HEIDKE SKILL SCORE: .3603
 CHI-SQUARE: 4.31

NO-A167 049 VERY SHORT RANGE STATISTICAL FORECASTING OF AUTOMATED 2/2
WEATHER OBSERVATION.. (U) FEDERAL AVIATION
ADMINISTRATION WASHINGTON DC PROGRAM ENGINEE..
UNCLASSIFIED R G MILLER MAR 86 DOT/FAR/PM-86/10 F/G 4/2 NL





MICROCOPY

CHART

PRECIPITATION AMOUNT (INCHES)

		VERIFYING OBSERVATION				ROW TOTALS
		.002 - .100	.001 - .0019	.000 - .0009		
PERSISTENCE	.002 - .100	0	0	18		18
FORECAST	.001 - .0019	0	6	119		125
	.000 - .0009	17	123	88761		88901
COLUMN TOTALS:		17	129	88898		89044
BIASES:		1.06	.97	1.00		
PERCENT CORRECT:	99.69%					
HEIDKE SKILL SCORE:	.0402					
CHI-SQUARE:	.18					

PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
PERSISTENCE	YES	0	0	0
FORECAST	NO	0	89044	89044
COLUMN TOTALS:		0	89044	89044
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

FROZEN PRECIPITATION OCCURENCE (Y OR N)

		VERIFYING OBSERVATION		ROW TOTALS
		YES	NO	
PERSISTENCE	YES	0	0	0
FORECAST	NO	0	89044	89044
COLUMN TOTALS:		0	89044	89044
BIASES:		99.99	1.00	

PERCENT CORRECT: 100.00%
 HEIDKE SKILL SCORE: *****
 CHI-SQUARE: 0.00
 THREAT SCORE: *****

END
FILMED

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